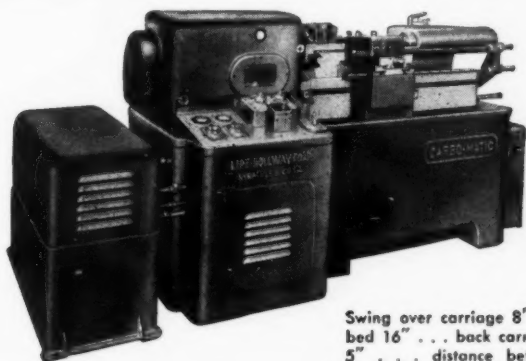


MACHINE TOOL BLUE BOOK

MORE output per man hour



Swing over carriage 8" . . . over
bed 16" . . . back carriage travel
5" . . . distance between cen-
ters 30".

LIPE *Carbo-Matic* LATHE

Will your first-quarter production be low?
. . . your second-quarter labor costs be high?
There's a way out—greater output per man
hour and week. The Lipe Carbo-Matic Lathe
will help you get it.

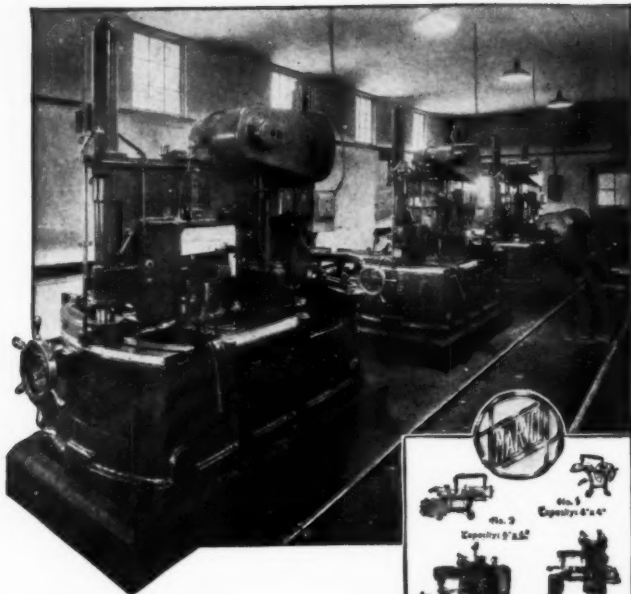
Super-powered for heavier cuts, it has a
wide selection of speeds in the range best
suited to carbide tools. Deflection and weaving
are eliminated by a bed and headstock cast
in one piece, and by a massive tailstock ad-

quate to hold high-speed centers without
vibration. Chatter, tool wear and breakage
are sharply reduced by the smooth-flowing
power of a fully-enveloped cone-and-worm
gear drive.

Completely automatic with a smooth flexi-
bility of control that affords a large number
of set-up combinations for a greater variety
of work, the Lipe Carbo-Matic holds operator
motions to a minimum.

WRITE OR WIRE FOR PRICES AND DELIVERY DATES

Lipe - ROLLWAY CORPORATION
SYRACUSE 1, NEW YORK



EASILY CUT-OFF TOUGHEST STEEL

Steels just don't come too tough for MARVEL Giant Hydraulic Hack Saws. Take, for example, the three No. 18 MARVEL Saws, at the Babcock & Wilcox steel mill, shown above. These machines are used to cut test specimens for sample pieces of stainless and other tough alloy billets which are checked for seams, pipes, etc., before being drawn into tubing. It takes tough steel to make the best tubing, and it takes modern sawing equipment to cut it rapidly, accurately and economically.

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ARMSTRONG-BLUM MFG. CO.

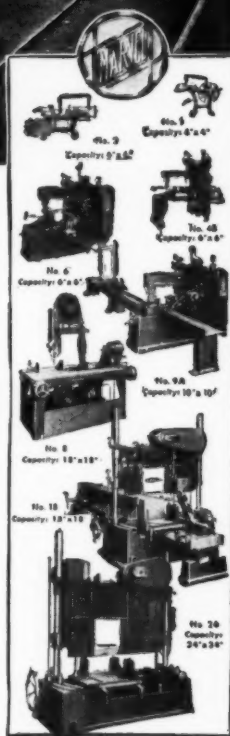
"The Hack Saw People"

5700 Bloomingdale Avenue

Chicago 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS



here's where
better
welding
starts, right
at the job

...with the "1000 combinations" and
remote control dials of

HOBART *simplified arc welders*



Convenient Polarity Switch
Time-saving Remote Control



Both of these convenience and operation features are found **exclusively** in HOBART! The "1000 combinations" let you select the exact welding heat for every job—the "remote control dial" is removable from the machine, enabling you to change welding heat at the work, without returning to the machine. Every Hobart feature lets you weld faster and better, with economy. Use the coupon for details.

HOBART BROTHERS CO., Box TB-56, TROY, OHIO
"One of the World's Largest Builders of Arc Welders"



—Reach for Your Scissors!—

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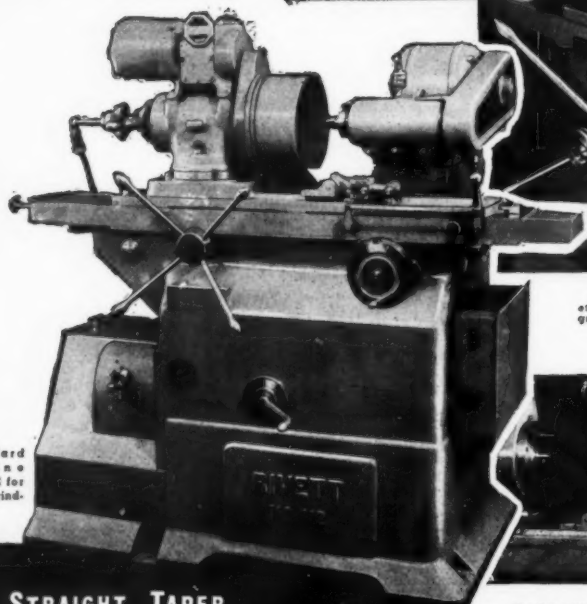
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A MORE *Versatile* PRECISION GRINDER

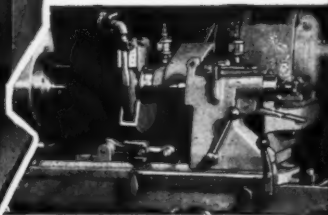
RIVETT



Standard machine equipped for internal grinding.



Fine table feed with micrometer stop for shoulder and face grinding.



Bracket with spindle for external grinding and tail stock for mounting work on centers.

FOR STRAIGHT, TAPER, BEVEL OR STRAIGHT AND BEVEL GRINDING

The Rivett No. 112 Universal Grinder is primarily for tool room work. Internal and external spindles, in combination with many adjustments, make possible a greater variety of precision operations. Extreme simplicity of design assures easy and efficient operation by even the lay machinist.

SPECIFICATIONS

Grinding cap., hole dia.	1/4" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	1/2" to 8"
Table speeds	18 selective
Hand table travel	16"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	90°
Cross feed graduations	.0005"
Travel of cross slide	3 1/2"
Collet capacity	8"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead speeds	
Spindle	150-450 r.p.m.
Dead center	100-300 r.p.m.
Grinding spindle speeds	
Internal	5000 to 25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

RIVETT LATHE & GRINDER INC.



BRIGHTON, BOSTON, MASS.

The **HARDINGE** DV59 Precision Lathe ELMIRA, N.Y.

is the only precision lathe
with
Hardened and Ground Steel Dovetail Bed Ways

This means:

SUSTAINED ACCURACY

Hardened and ground steel bed ways.

FINISH

Ground to master gages after hardening.

RIGIDITY

Bed ways are from one piece of solid steel.

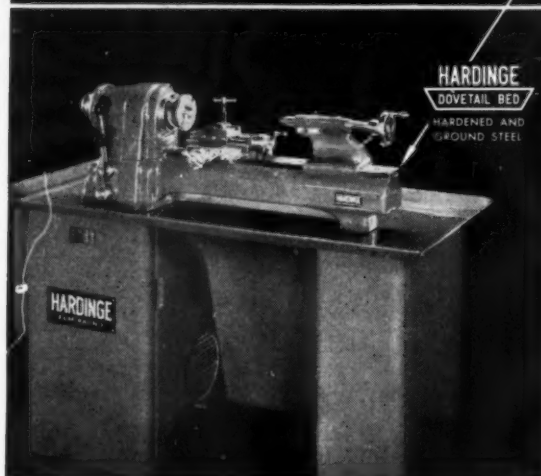
PROTECTION

Chips cannot fall on inverted angular ways.

ALIGNMENT

Dovetail ways align attachment accurately.

Ask for Bulletin DV59



HARDINGE DOVETAIL BED

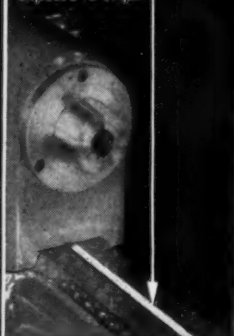
HARDENED AND
GROUND STEEL

OLD STYLE CONVENTIONAL BEDS:

Are made of cast iron.

Have weakening center slot.

Have angular ways which are
exposed to chips.



ARMSTRONG



ARMSTRONG TURNING TOOLS for
ARMSTRONG HIGH SPEED or other
High speed steel cutter-bits



ARMSTRONG CA TOOL HOLDERS
for ARMALLOY and similar cast-
alloy cutter-bits.



**ARMSTRONG Carbide TOOL
HOLDERS** for ARMIDE and sim-
ilar carbide-tipped cutters



SYSTEM OF TOOL HOLDERS

**What speed do you need?
100, 300 or 600 ft. p. m.**

Whatever cutting speed is required, whatever the material to be machined, there are correctly designed **ARMSTRONG TOOL HOLDERS** with bits, blades and cutters of the most efficient cutting material provided by the Armstrong System of Tool Holders.

Included are:

HIGH SPEED Cutter Bits, 50-150 ft. p.m.

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"The Tool Holder People"

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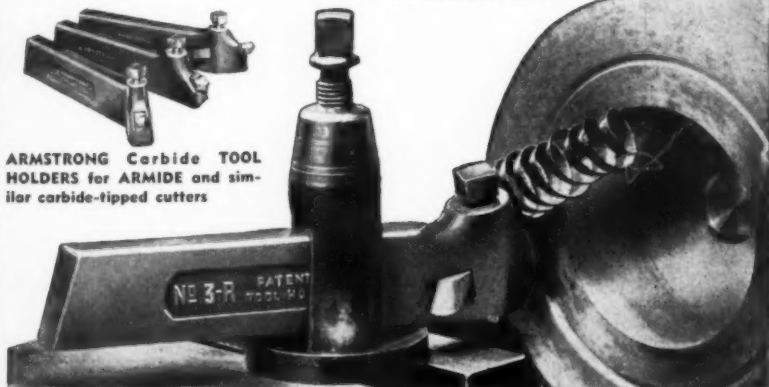
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New York 12, N. Y.

Pacific Coast Whse. and Sales Office:

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San Francisco 3, Calif.



Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

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Volume 42, No. 3

MAY 1946

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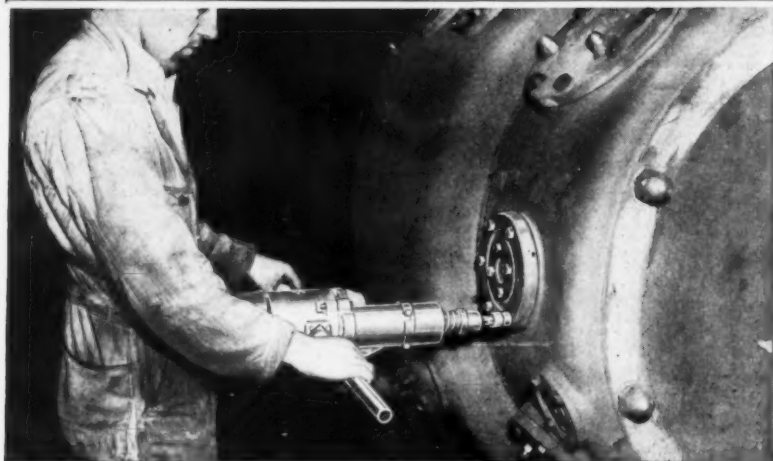
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It's a matter of seconds to tighten a nut



with a CP Universal Nut Runner

CP Universal Electric Nut Runners are big time-savers in automobile and airplane assembling, furniture and cabinet making, sheet metal fabrication, building construction, marine and railroad work. Wide range of capacities, from CP Midgets for nuts up to 3/16", to heavy duty models for nuts up to 1" and lag screws to 5/8" x 6". CP Universal Nut Runners can be furnished with reversing switches for backing off nuts, also Right-Angle models. Write for Catalog No. 899.

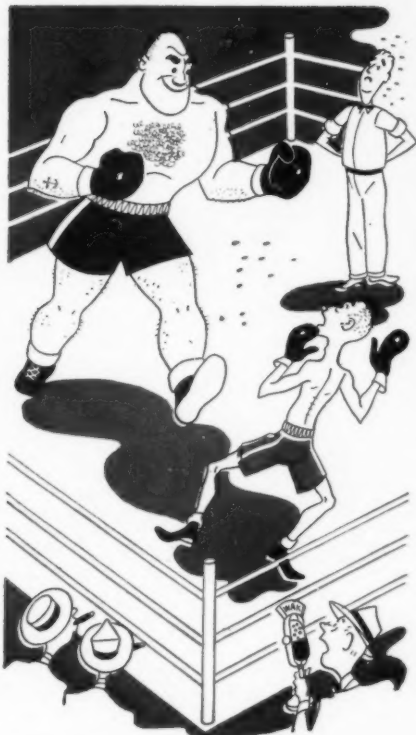
Chicago Pneumatic manufactures a complete line of Universal Electric Tools — Drills, Reamers, Tappers, Screw Drivers, Nut Runners, Grinders, Sanders, Buffers, Flue Rollers, Hammer Drills, Sealers, Files.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



you wouldn't

**match a bantamweight
against a heavyweight**

Nor should you put carbide cutting tools on a lathe lacking the fundamentals for their most efficient use. These cutting tools have increased horsepower requirements 300 per cent and more. They have increased cutting speeds 200 to 500 per cent.

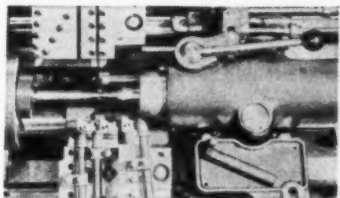
Your profits may well depend upon the efficiency of your turning operations. For instance, in your plant, turning probably accounts for 25 per cent or more of machining time. This could be substantially reduced by the most efficient use of carbide cutting tools, and an important saving in manufacturing cost effected.

It will pay you to check now on the production efficiency of all metal turning equipment in your plant — and to replace it, if need be, with high production war surplus machines or new machines. Jones & Lamson Fay Automatic Lathes and Universal Turret Lathes are designed specifically for the most efficient use of carbide cutting tools.

We are anxious to assist all owners of Jones & Lamson equipment bought from government surplus, to obtain the best possible results from their purchases. Telephone or write to us for complete particulars.

What Horsepower Are YOU Using?

15 horsepower is required to turn and face this small steering rod at the high surface speeds required by the carbide cutting tools. Fay Automatic Lathes are designed specifically for the most efficient use of carbide cutting tools.



Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

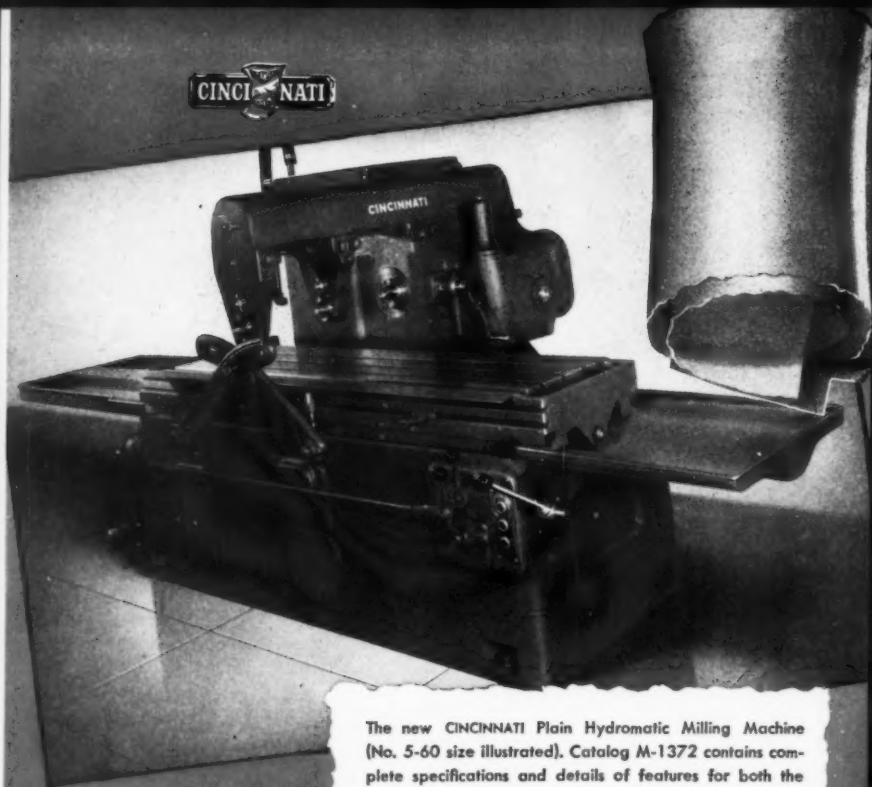


JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

Fay Automatic Lathes

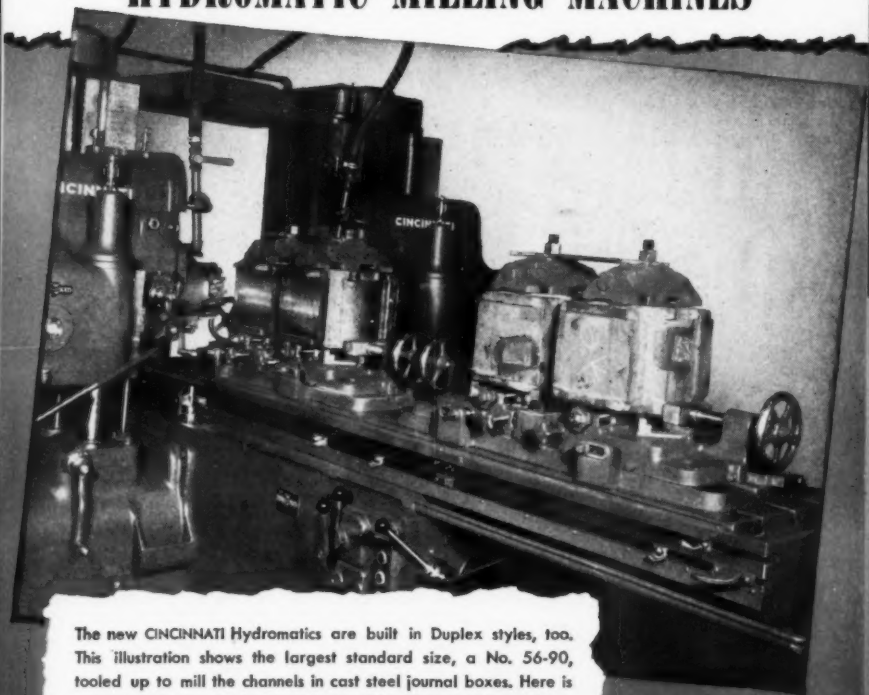
Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.



The new CINCINNATI Plain Hydromatic Milling Machine (No. 5-60 size illustrated). Catalog M-1372 contains complete specifications and details of features for both the Plain and Duplex styles.

● You can expect big things from the new CINCINNATI Hydromatics. They're heavier, and much more powerful. They incorporate all the time-proved Hydromatic features, plus many new and exclusive advantages which make them especially useful for heavy cuts and rapid metal removal on all types of metals, and using all types of cutters including sintered carbide. The new CINCINNATI Hydromatics are built in twelve sizes, in Plain and Duplex styles, ranging from 24" to 90" table travels, powered by 7½ to 30 h. p. motors (higher if desired), depending upon the size of the machine. Catalog No. M-1372 contains complete specifications and other important details. A copy of this informative book is yours for the asking.

Introducing **THE NEW CINCINNATI HYDROMATIC MILLING MACHINES**



The new CINCINNATI Hydromatics are built in Duplex styles, too. This illustration shows the largest standard size, a No. 56-90, tooled up to mill the channels in cast steel journal boxes. Here is concrete evidence of the ruggedness and cutting capacity of these new machines. Both spindles are taking a cut $\frac{3}{8}$ " deep by 11" wide (the full diameter of the cutters).

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES

• BROACHING MACHINES

• CUTTER SHARPENING MACHINES

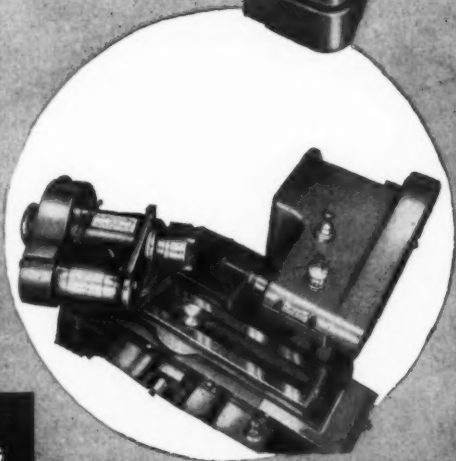
GRENBY HYDRAULIC GRINDING MACHINES

FEATURES

- Infinitely Variable Longitudinal Traverse
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)

EG103 SPECIFICATIONS

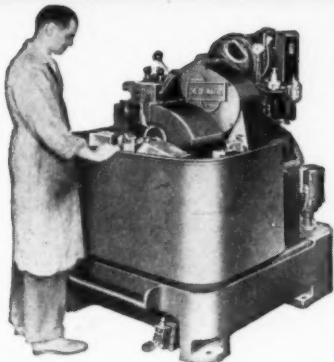
Work Capacity—3" Dia. x 10" Length
 Workhead Accommodates—Collets 1" Max. Hole
 —Chucks & Face Plates 4" Max.
 Clear Space & Wt. 45" Long x 25" Wide—1600 lbs.



THE
**GRENBY MANUFACTURING
 COMPANY**
 PLAINVILLE, CONNECTICUT

New Acme-Gridley CHUCK-MATIC

SINGLE SPINDLE 12" CHUCKER



★ Radically
different
from any
other
single
spindle
machine

For heavy-duty, high-production work on castings, forgings and tubing parts. Specializes on such primary operations as straight or taper boring, form boring or form turning, drilling, turning, forming, facing and chamfering.

The 12" Chuck-Matic is an entirely new design. It is an air-operated automatic—cuts machine costs on short runs as well as long runs.

IT IS RUGGED—Heavy frame and new design gives you every advantage of modern tooling methods. Maintains precision, undisturbed by heavy feeds with high speed or carbide tipped tools.

IT IS FAST—Idle movements are cut to the minimum. Setup is quick and easy. Quick change from job to job. Adjustments easy through unusual accessibility.

UNSKILLED OPERATORS can run it. Automatic safety devices control both manual functions and mechanical movements—protecting operator, work and machine.

SPACE SAVING is a special advantage. Floor space required, 45" x 64". Convenient to locate. Operator can tend as many machines as job cycle times will permit. Bulletin SC-46

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Chucking Automatics • Single Spindle
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Taps • The Chronolog • Limit, Motor Starter
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**AN IMPORTANT ITEM OF
NEW EQUIPMENT AT
*Green Bay & Western***

Two photos of Green Bay
and Western Railway's
Carburizing Installation.



The illustrations show the Hevi Duty Electric Vertical Retort Furnace recently installed in the Green Bay and Western's blacksmith shop at Green Bay, Wisconsin. As an important factor in the speedy production of maintenance parts, this flexible furnace, for use in carburizing, hardening and annealing, gives to the maintenance shop an all purpose, precision heat treating unit. Operating costs are low. There are numerous sizes of this type and other Hevi Duty heat treating furnaces for production maintenance

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What's all this about SUPERFINISH?

• If you've thought of *Superfinish* as a layishment, then perhaps it's time to look into it a little further. You'll find enough evidence to change your notions—and perhaps give you a new competitive advantage in the form of lower costs.

No matter how fine a ground surface may appear to the eye, it has defects . . . scratches and ridges produced by the point of the turning tool . . . larger defects such as grinder feed spirals and chatter marks . . . partially loosened splinters of metal ready to come off on contact with another surface . . . soft surface metal, annealed by the heat of the grinding wheel. In practically every case, fragmented metal will be torn from the mating surfaces to mix with lubricants, causing abrasive wear and creating a larger amount of clearance.

Superfinishing prevents this by removing both grit scratches and longer pitch defects due to minute machine tool inaccuracies. It provides the surface smoothness to maintain a uniform oil film—to reduce wear—to eliminate bearing trouble and lengthen bearing life.

Superfinishing is a quick and inexpensive process. And in many cases it can reduce present manufacturing costs by eliminating other more costly processes. This is a good time to get complete information about *Superfinishing*. Write us.

GISHOLT MACHINE COMPANY
1185 East Washington Avenue • Madison 3, Wisconsin



Look ahead
keep ahead
with Gisholt



This photomicrograph (25 x magnification) shows a ground surface with the familiar scratches and ridges caused by single direction stock removal. Surface roughness is 35 micro-inches (Profilometer reading).



The same piece, 30% Superfinished to 15 micro-inches. Note how ridges have been reduced. A completely Superfinished surface of 2 to 3 micro-inches will leave no defects to penetrate the oil film or abrade the mating surfaces.

Now...



Portable Bryant Thread Gages

Bryant Thread Gages have proved their superiority for bench work . . . now, the new Portable gage offers fast, accurate inspection of internal threads in large castings, work in the machine, etc., or in any parts where bench inspection may be inconvenient.

The Bryant Portable Thread Gage is so accurate that it can be used to check master gages, and on production work it will check threads all over in a few seconds. It is 4 to 5 times faster than plug gaging. Retracting gage segments eliminate threading the gage into and out of threaded holes — they prevent wear — on Class 4 and 5 fits, selective assembly is possible by classing threads according to indicator readings — pilots on back of thread segments mean rapid, catchless insertion and removal of the gage — there is no chance of cross threading.

The fastest, cheapest, most accurate method of inspecting threads is the Bryant method — it is the only method for visually indicating the size of internal threads. Write for complete details.



Perfect for inspecting threads on large pieces that cannot be moved conveniently to the inspection department.



Allows checking of threads in the work in the machine.



Eliminates threading of gage into and out of threaded holes.



Four or five times faster than plug gaging.



Gives overall inspection in a few seconds—at a glance.



Master gage accuracy transferred quickly to production parts.

BRYANT

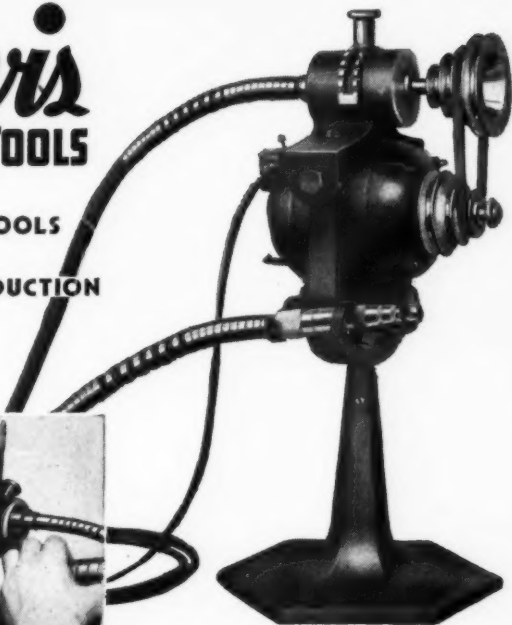
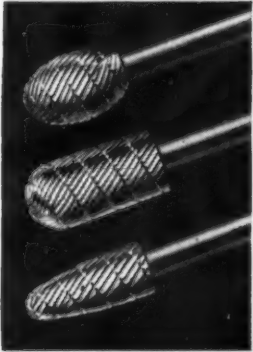
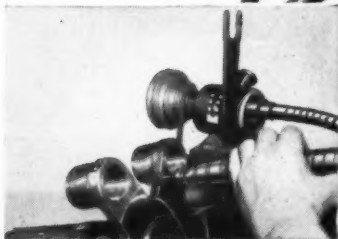


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**HIGH SPEED TOOLS
for
HIGH SPEED PRODUCTION**



Jarvis Flexible Shaft Machines

When used with correctly selected Jarvis Rotary Tools, these multiple-speed flexible shaft machines are the "power hands" of the metal working industry. They will perform many filing, grinding, sanding, buffing, brushing, cutting, and cleaning operations.

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The recognized standard in thousands of manufacturing plants for fast, efficient performance. Now furnished with Jarvis Hy-speed Case, increasing tool life an average of three times. Send your high-speed steel rotary files back to Jarvis for regrounding. They will be furnished with life prolonging Hy-speed Case.

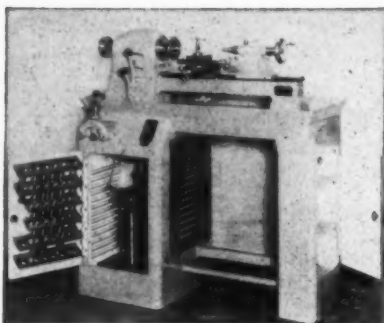
Send for our new catalog MFTI

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

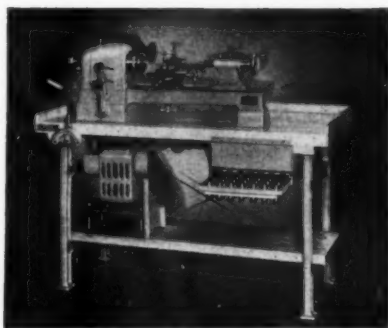
**ON SMALL DIAMETER
PRECISION WORK . . .**

Assure Ultra



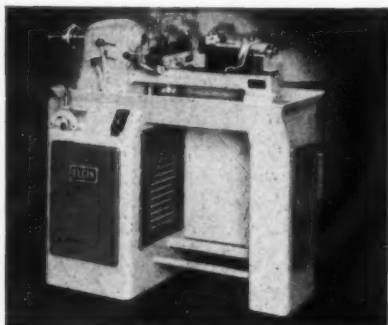
Elgin Knee Hole Type Bench Lathe

Has Variable Speed Drive with range from 120 to 3800 RPM. 9" swing, 17" between centers, 1" collet. Generous leg room for operator. Door of motor cabinet fitted with collet rack. Three roomy storage shelves.



Elgin Open Bench Lathe

Laminated hard maple top, enclosed motor, safety guard for belt, handy collet drawer. Variable Speed Drive for any spindle speed from 120 to 3800 RPM. 9" swing, 17" between centers, 1" collet.



Elgin Knee Hole Type Hand Screw Machine

Variable Speed range, 120 to 3800 RPM. 9" swing, 1" collet capacity. Collet rack inside of motor compartment door. Independent coolant system (5 gal.) mounted in rear, outside—cleaner, more accessible.



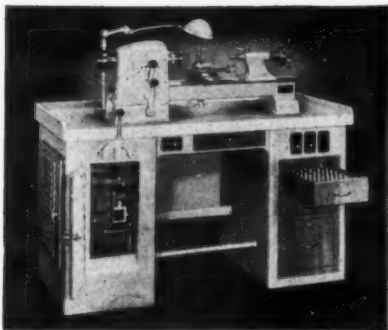
Elgin Vertical Bench Milling Machine

Preloaded ball bearing spindle. 9/16" collet capacity. Five speeds ranging from 400 to 4000 RPM. Vertical travel of spindle, 1 3/4". Table 4 1/2" x 18". 90° swivel each side of center line.

★ ELGIN TOOL WORKS

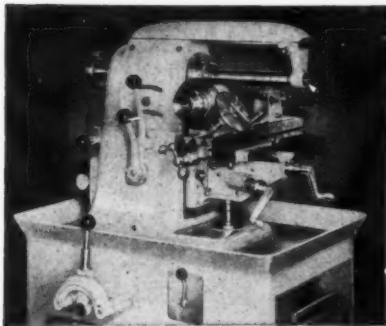
Efficiency WITH

ELGIN BENCH TOOLS



Elgin Desk Type Bench Lathe

Variable Speed Drive, 40 to 4000 RPM. Low speed rate for grinding operations. Free turning spindle for truing-up and setting work by hand. Ample drawer space. 9" swing, 17" between centers, 1" collet.



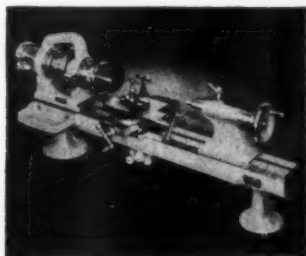
Elgin Horizontal Bench Milling Machine

Variable Speed Drive, 85 to 2750 RPM. Collet capacity, 1". Table 4 1/2" x 18". Longitudinal travel, 12". Transverse travel, 6". Vertical travel, 6".

**1772 BERTEAU AVE.
CHICAGO 13, ILL.**

The entire line of ELGIN High Speed Precision Bench Tools is designed to pay you dividends in better machining results, faster production, greater versatility, maximum operator convenience. The machines shown here assure "complete coverage" of your needs for both toolroom and production work. Note the trim, clean-cut lines . . . the provisions for operator comfort . . . the ample storage space for tools and accessories. And remember—the Elgin Bench Tools shown in the large illustrations (with exception of Vertical Miller) are equipped with the **VARIABLE SPEED DRIVE** which permits instant changes of spindle speeds over a wide range of RPM without stopping spindle and shifting belt. Operator is encouraged to use proper speed for each operation, changing as often as necessary . . . which means closer precision, better finishes. Write for specifications, prices, delivery dates!

**Two
Lathes
at Right**
(reading top
to bottom)

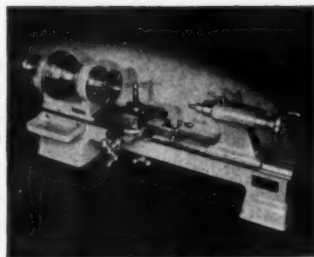


(Upper) Model CB-5C Precision Bench Lathe

Open Cone Headstock. 1" collet capacity, 9" swing, 17" between centers, 36" bed. Speeds up to 4000 RPM. Flat belt only.

(Lower) Model 4EY Precision Bench Lathe

Open Cone V-belt Headstock. For either V or flat belt. 7/16" collet capacity, 7" swing, 17" between centers, 33" bed. Speeds to 10,000 RPM.



MACHINE TOOL BLUE BOOK

then he said to himself:
"Beat their brains IN... not out"



AGED Japanese Diet member, YUKIO OZAKI, lifelong champion of parliamentary government, recently called upon his colleagues to resign rather than persist in blind obedience to government. Said he:

"Our people of today do not know right from wrong. We must pour into their heads the law of humanity and the difference between right and wrong."

The difference between the right way of doing things and the wrong way would seem an easy thing to knock into heads, —but even here in America it sometimes takes **KNOCKS** like that of the **SHERIFF** to awaken interest;

—while with others the gentle **KNOCK** of **OPPORTUNITY** spurs them to deeds for the good of all.



LOOK, OZAKI . . . Here is the difference between **RIGHT** and **WRONG** in manufacturing a bracket such as shown:

WRONG:

**RIGHT:**

Cost 8¢ each
of welded steel.

DIFFERENCE:
Saved 5c Each

This bracket, 10 of which are used on each harrow, is typical of many parts changed over to welded design by an implement manufacturer. Perhaps your product has similar parts. The Lincoln Engineer will gladly help you study the possibilities of welded design as applied to your problems.

STUDIES IN MACHINE DESIGN . . . issued periodically. Free on request. Ask for them on your business letterhead.

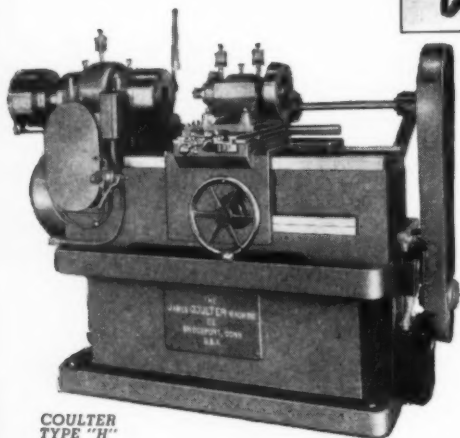
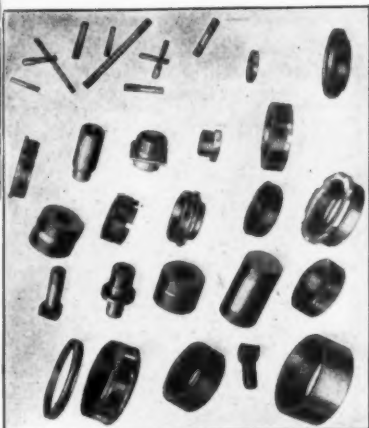
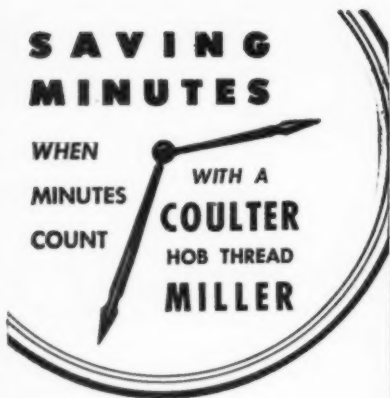
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or special face plate fixtures
can be threaded.

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Here's Why

GORTON

SUPER-SPEED VERTICAL MILL

MANUFACTURER'S TEST PROVED THAT THE
GORTON WOULD MACHINE THE BORING BARS
WITH THE GREATEST ACCURACY, SPEED,
RELIABILITY AND EFFICIENCY

Four operations were required to machine the tool hole in the boring bar shown above. They included counter-boring, drilling, reaming and milling. To determine what mill would maintain the specified accuracies and complete the job in the least amount of time, test runs were made on a number of units.

Of the mills included in the test, a Gorton $8\frac{1}{2}$ -D Vertical Mill was selected as the machine to perform the operation because it proved the most highly efficient from every point-of-view... accuracy, speed, finish, ease of operation.

In this manufacturer's own words, the factors responsible for the superiority of the Gorton are "The Gorton is more solidly and accurately built than competitive machines designed for similar work."

HOW TO PRE-DETERMINE GORTON PERFORMANCE ON YOUR WORK

Gorton Super-Speed Millers are available in several models for a wide range of milling work. It is highly possible that the right model can produce equally outstanding results on jobs now being run in your plant. You can pre-determine Gorton results for yourself by using Gorton Engineering Service. Mail detail prints or work sample to Gorton at the address below. Tooling information and production estimates will be furnished promptly—no charge or obligation.

FREE For details on Gorton Super-Speed Vertical Mills as well as Duplicators and Pantographs, write today for Bulletin No. 1655.



JOB FACTS

NAME OF PART—Boring Bar with Micrometer Adjustment.

MATERIAL—Alloy Steel.

MACHINE—Gorton Vertical Milling Machine Model $8\frac{1}{2}$ -D.

FEED—Hand.

OPERATIONS—

1. Counterbore— $1\frac{1}{16}$ "; 900 r.p.m.
2. Drill— $2\frac{3}{4}$ "; 1350 r.p.m.
3. Ream Drilled Hole—.369" and .375"; +.0005"; -.0000"; 1350 r.p.m.
4. Milling Eccentric Groove $\frac{3}{8}$ " dia. x $\frac{1}{32}$ "; +.0000"; -.0005"; offset .093"

TIME—15 minutes, floor-to-floor time.

REMARKS—Completed on a production basis with high accuracy and finish.

GEORGE GORTON MACHINE CO.

1405 MADISON STREET, MADISON, WISCONSIN, U.S.A.

NOTICE Who Uses

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welds complete steel doors
in one whack.

Refrigeration Manufacturers

weld steel cabinets ten
times faster than old
methods.



Radio and Instrument Makers

weld three parts of
tube at once . . . 2,500
per hour.



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Somator and Adams Co., Cleveland—SPECIAL HIGH PRECISION MACHINES

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MACHINE

Federal

AUTOMATIC WELDING

It is significant that metal fabricating industries noted for producing the most goods at lowest unit cost are the largest users of automatic resistance welding... also that Federal welders fill the "lion's share" of such applications.

Nowhere are production costs more critically scrutinized than in the automotive industry—which uses and continues to order more Federal Resistance Welders than any other group. One reason is the sort of production illustrated at left. Two full-door-size stampings are welded into permanent union in a single pass through one of the latest machines developed by Federal in collaboration with designers of the door itself. Refrigeration, radio and instrument makers follow this lead for the same reason—that fabricating costs are cut by Federal.



Not all of these applications call for special machines. There is a wide variety of basic types in the Federal welder line. Infinite variations of each are available with simple adaptations. Whatever YOU make in metal, it makes sense for you to study the practical reasons why the big timers, and others as well, turn more and more to fabrication with Federal Resistance Welding. It pays to do this before your product design is completed.

Get a copy of Federal Bulletin SP 346, which briefly describes each of the basic welder types. Then let a Federal Engineer prove to you that the best production welding is by

**GET THIS
BULLETIN**
describing all of the
basic types of Federal
Resistance Welders.

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216 DANA STREET • WARREN, OHIO

Now Air-O-chek Air Guns with Screw-On Ferrules

Patented ball and socket connection between internal lever and the valve.



*Double Grip
Inside of hose held by
threaded shank—outside held
by serrated ferrule.*

*Precision machined from bar
brass and stainless steel.*



Easy to Install

Just trim hose square. Slip ferrule over the end, insert Air-O-Chek and screw up.

Made to fit 1/4", 5/16" and 3/8" one- and two-braid air hose. In ordering specify exact inside and outside diameter of hose.

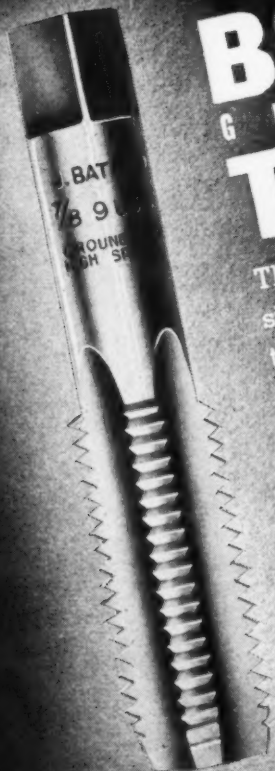
In machine shops, factories and foundries—wherever compressed air is used for blowing chips, grit, etc.—AIR-O-CHEK Air Guns have set new standards of leakproof dependability, ease of use and low maintenance cost.

Now AIR-O-CHEKS offer the advantage of convenient assembly direct to the hose without special tools. You just slip the new Screw-On Ferrule over the hose, insert the AIR-O-CHEK shank and screw up. The assembly is streamlined—free from protruding clamps or screws. No costly equipment used in contracting or expanding ferrules is required. You can attach the AIR-O-CHEK on the job using only wrenches.

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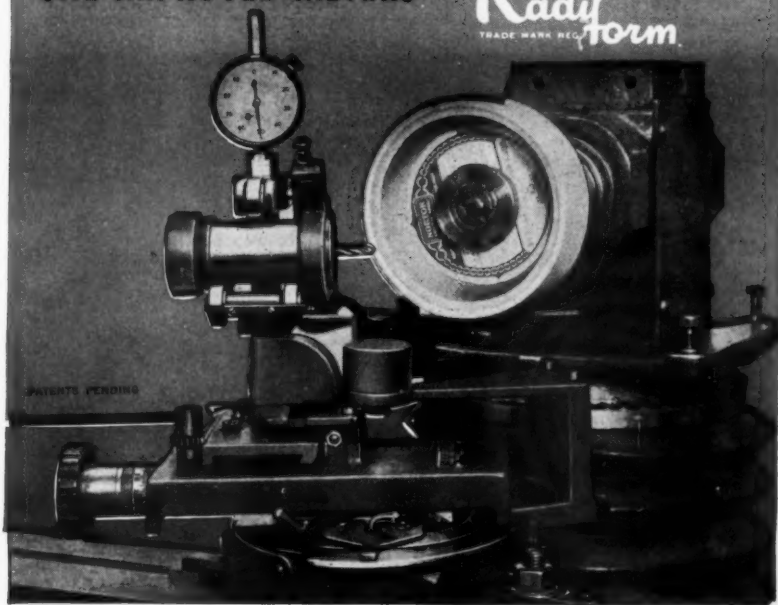
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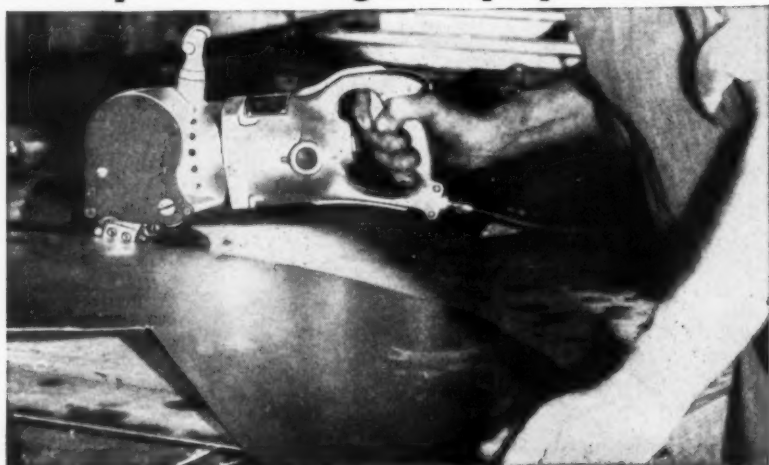


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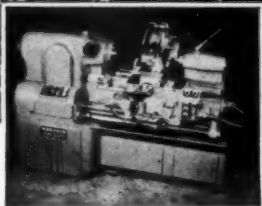
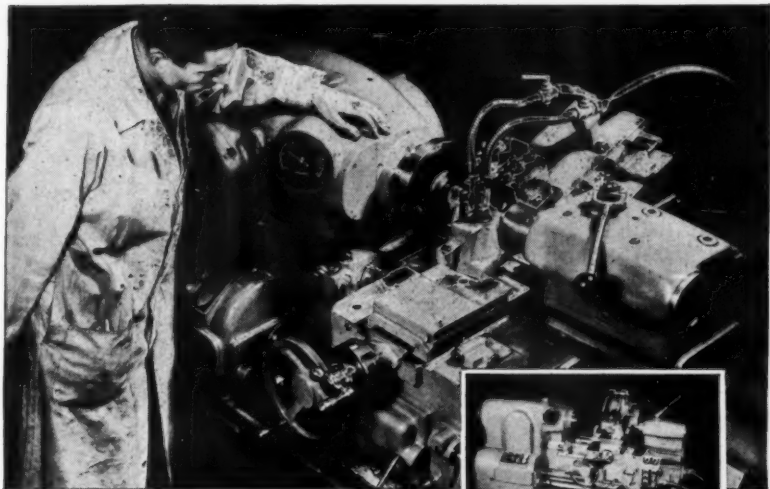
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Norgren Industrial Hose Assemblies defy failure under the toughest kind of service—deliver dependable power for any hydraulic or pneumatically operated machinery.

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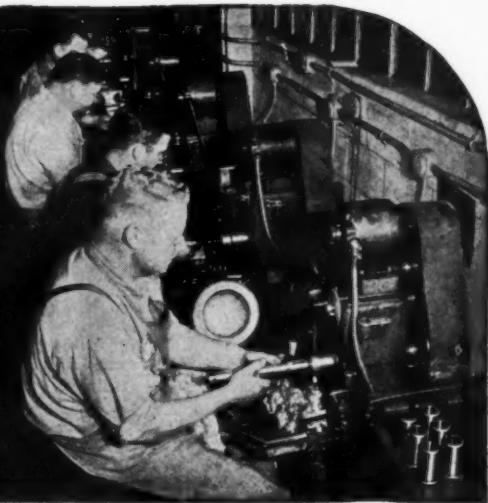
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It's the Backbone
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.0003" AND
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FINISH
ON STEEL
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SUNNEN *Precision* **HONING MACHINE**

...at Universal Engineering Co., Frankenmuth, Michigan



The Sunnen Precision Honing Machine is practical, low in cost, easy to operate, quickly and easily installed, and easy to set up. It corrects errors of out-of-roundness and taper—corrects wave effect or rainbow condition—maintains alignment between two holes.

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Do you have an internal sizing or finishing problem that demands accuracy to as low as .0001" tolerance for size—and an absolutely straight hole? On any job from .120" to 2.625" in diameter, the Sunnen Precision Honing Machine may be the ideal solution.

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Typical Jobs



Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro-inch finish.



Bearing. A very small part. 2 micro-inch finish necessary.



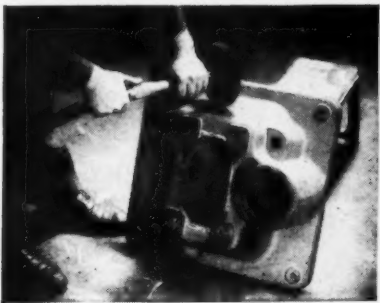
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1/2 H.P. Multi-speed counter shaft unit, 900 to 3600 RPM. Bench-height pedestal. 360° motor swivel.



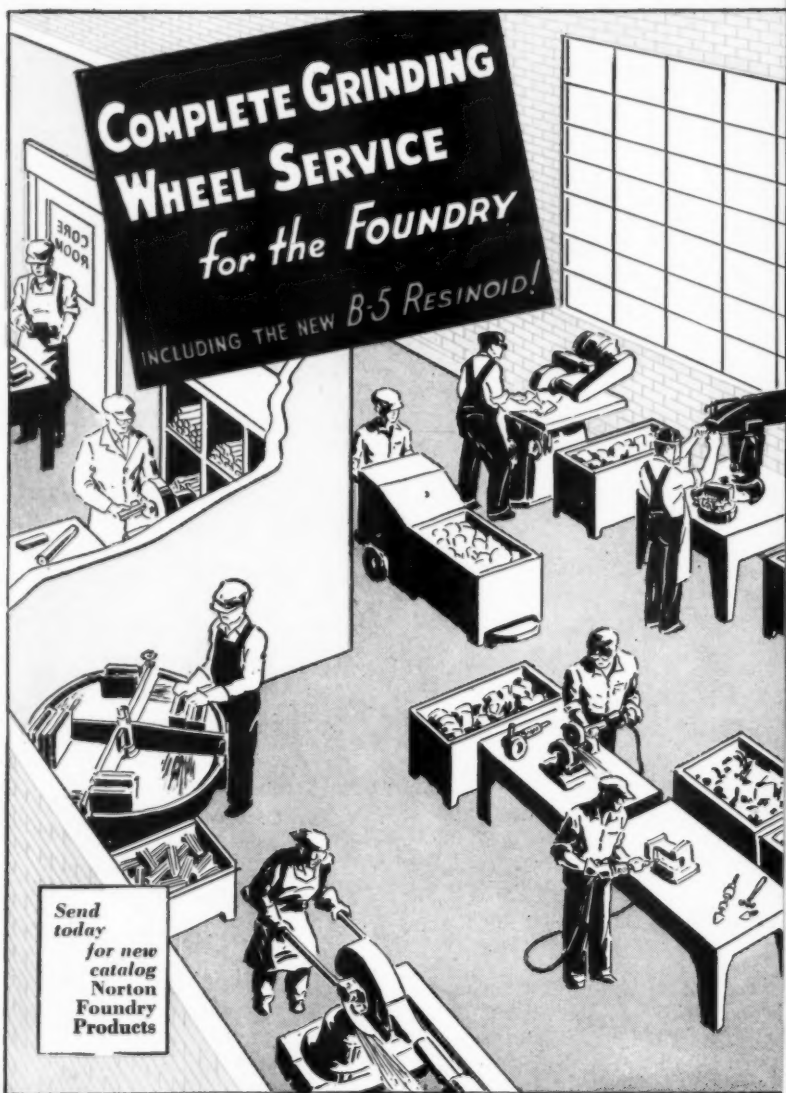
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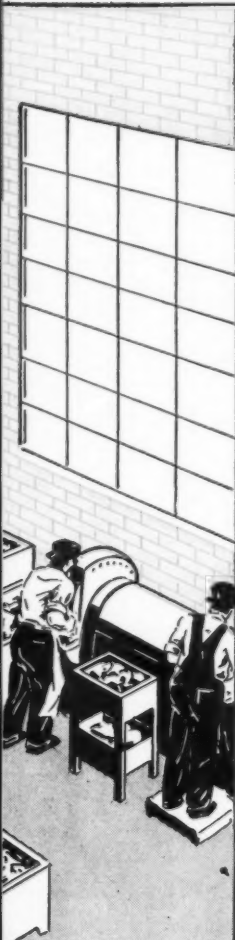
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On high speed grinders a popular B-5 specification for steel and annealed malleable castings is A123-P4B5 and for gray iron and unannealed malleable 37C14-Q4B5.

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DISC GRINDERS

For surfacing castings on disc grinders there's a complete line of Norton B-5 resinoid wheels—using 57 Alundum abrasive for steel and annealed malleable iron and Crystolon abrasive for gray iron, aluminum, brass and bronze.

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There's a complete line of Norton wheels for foundry cut-off machines—both rubber and resinoid bonded wheels—for cutting brass, aluminum, bronze and steel.

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For cleaning castings in the hard-to-get-at places there's a complete line of Norton Mounted Points and Wheels—made of Alundum or Crystolon abrasive, vitrified or resinoid bond.

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For smoothing and shaping sand cores there are Norton Core Files—made of hard, sharp Crystolon abrasive, resinoid bonded and reinforced with a strip of steel. For quickly cutting stock cores to length there are Norton Cut-off Wheels—suggested specification 37C24-N8B-K.

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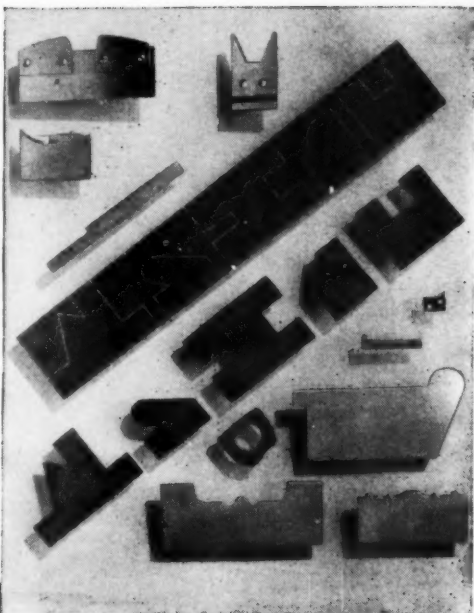
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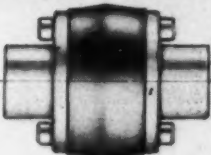


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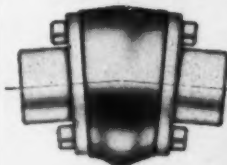
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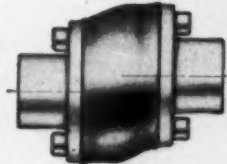
Exaggerated to show Ballflex Operation Under Varying Conditions



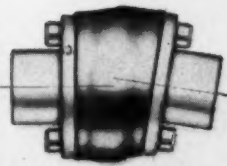
Normal operation with connected shafts in parallel alignment



Showing the effect of angular misalignment



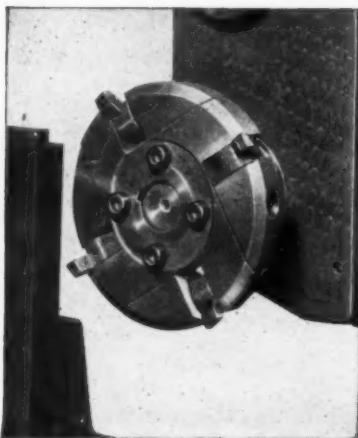
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**Designed especially for Shell End
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FOR SLOT CUTTING — STRADDLE MILLING — FLAT SURFACES — ON ALL METALS AND PLASTICS

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Fly-wheel action increases cutting momentum — gives more precise finish — less heating of the finished surface. Adaptable for high rate milling on all classes of metals and plastics.

The perfect form of multiple fly cutter — eases load and impact on milling machines, lengthens cutter life between grinds, permits more chip removal per horse power.

Regular models 4" to 10" diameters — $\frac{5}{8}$ " and 1" width. Extra Heavy, 6" and 8" diameters, $1\frac{3}{8}$ " width. Write for latest descriptive bulletin.

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MODEL
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For fast, efficient rough grinding and fine finishing of carbides, stellite, high speed steel, and other modern tools, install Prosser Carbide Grinders. Their rugged construction, modern design, and ease of operation insure long, dependable and profitable service.

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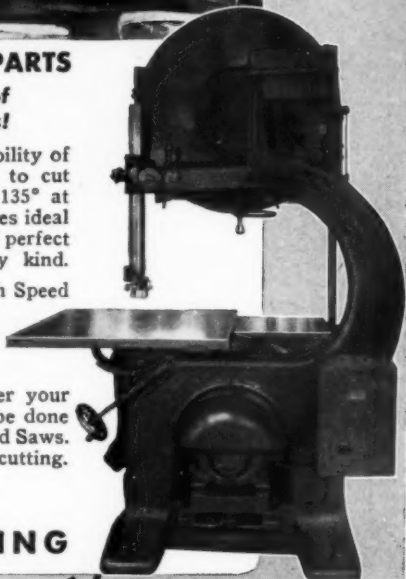


of TRIMMING FORMED PARTS

**and performing a host of
other metal cutting jobs!**

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



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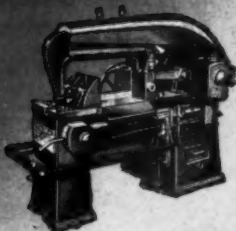
**FRICTION
SAWING**

with
Tannewitz

HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS **GRAND RAPIDS**
4, MICHIGAN

**modern
HIGH SPEED
metal cutting**



That lowers production costs

Here is modern high speed metal cutting—with greatest efficiency—at the start of a great production line. This battery of Racine heavy duty Hydraulic metal cutting Machines in a prominent midwestern steel mill, is speeding up the plant capacity.

These smooth, powerful hydraulic Machines save time and material. Their accuracy reduces the cost of subsequent machining operations—all factors in helping you meet the post war need for maximum efficiency, increased output, lower costs.

A complete series of Machines from 6" x 6" to 20" x 20". Get our catalog No. 12. Also ask for Free production estimates on your specific work. Write today.



RACINE OIL HYDRAULIC PUMPS AND VALVES

Consider Racine *Variable Volume* Pumps and Racine Valves for your oil hydraulic circuits. Pump 0 to 50 G.P.M. Operating pressures 50 to 1000 lbs. p.s.i. Valves in all sizes from $\frac{3}{8}$ " to $1\frac{1}{2}$ " I.P.S. Full information in our catalog P-10-C. Write.

RACINE TOOL AND MACHINE CO., 1754 State St., Racine, Wis.



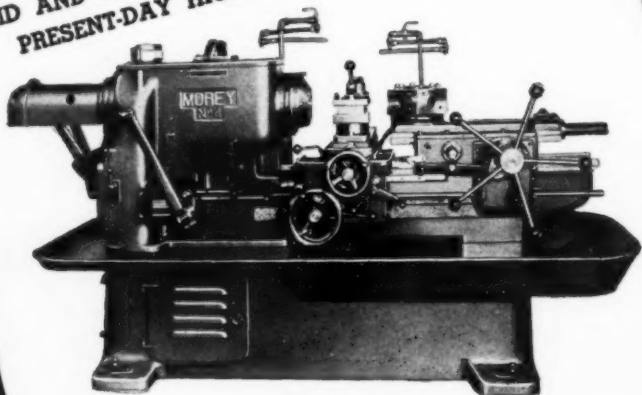
RACINE

Standard for Quality and Precision

MOREY *Universal* TURRET LATHES

for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!
EASY TO OPERATE • ACCURATE • DEPENDABLE.
RIGID AND POWERFUL ENOUGH TO FULLY UTILIZE
PRESENT-DAY HIGHSPEED CARBIDE TOOLS.



#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length, 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM

MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity
ASK FOR DESCRIPTIVE BULLETIN

STOCK DELIVERY

DESIGNED AND BUILT BY:

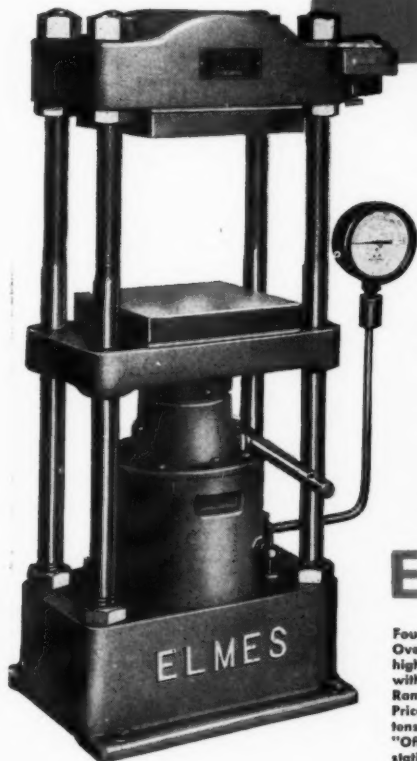
MOREY MACHINERY CO., INC

410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-37 26TH AVE., ASTORIA 2, NEW YORK

LABORATORY

Built to Elmes Big-Press Standards of Performance

PRESSES



Small presses that are *built right* quickly pay for themselves in time and money saved.

In machine shops, tool rooms, and assembly and maintenance departments these *capable* little units are most welcome additions to plant facilities.

Inspectors use them for quick checks on purchased materials, for sampling tests on work in process, and for final inspection of finished products.

Industrial and commercial laboratories, universities, and colleges find these versatile small presses *indispensable* in development work on new products, new processes.

—and for short runs and small jobs of many kinds, a good laboratory press is itself an *ideal production machine*.

Ask us for Bulletin No. 1035A. It gives prices and complete specifications on 20, 30, and 50-ton models. All have Elmes precision-built hydraulic units with *honed* cylinder and wing-type *regrindable* valve.

ELMES HYDRAULIC EQUIPMENT

Four-column, 30-ton Model No. 6441. Over-all dimensions: $16\frac{3}{4}'' \times 13\frac{1}{2}'' \times 41''$ high. Opening: 0" to 12". Platen: $12'' \times 10''$ with full guides encircling all four columns. Ram: 4" diam., 6" stroke. Weight: 660 lbs. Price (Chicago) with gauge and lever extension: \$412.00. Electric hot plates with "Off-On" switch: \$108.00; with thermostatic control and temperature setting indicator for 220 V., A.C.: \$125.00. Other accessories: See Bulletin No. 1035A.

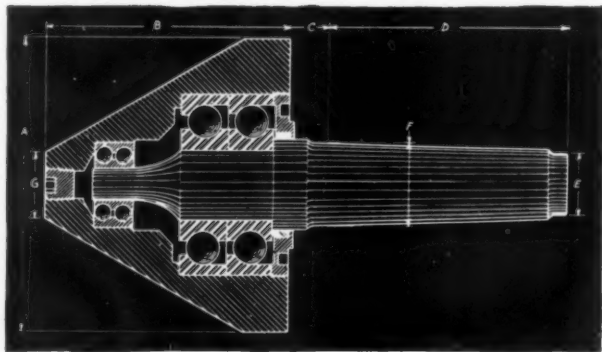
ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 244 N. Morgan St., Chicago 7, Ill.

Also Manufactured in Canada

METAL WORKING PRESSES - PLASTIC MOLDING PRESSES - EXTRUSION PRESSES - PUMPS - ACCUMULATORS - VALVES - ACCESSORIES

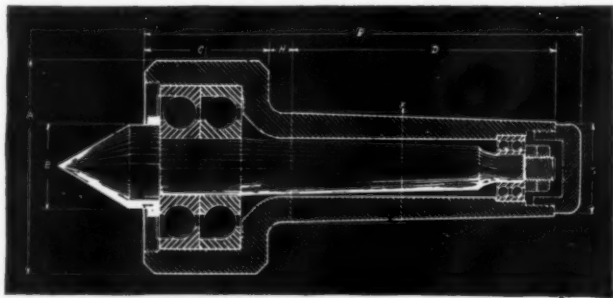
ROOFE LIVE CENTERS

Buy the Best - why try the rest



Bull Nose or Pipe Centers

Rooft Bull Nose Centers are used for any tubular machine work, tool joints, oil field or similar jobs. Bearing capacity 2,000 lbs. to 40,000 lbs. Nose sizes to your specifications.



Rooft Type "M" Centers

Type "M" Centers are used to rough turn, finish turn and to thread without chattering. Used on grinders to a tolerance of .0001". Have been used for turning shafts of 28,000 lbs. and castings weighing 46,000 lbs.

From an engineering standpoint Rooft Centers are basically correct in principle and meet the hearty approval of machinists. Standard or Special Tapers can be furnished to your specifications.

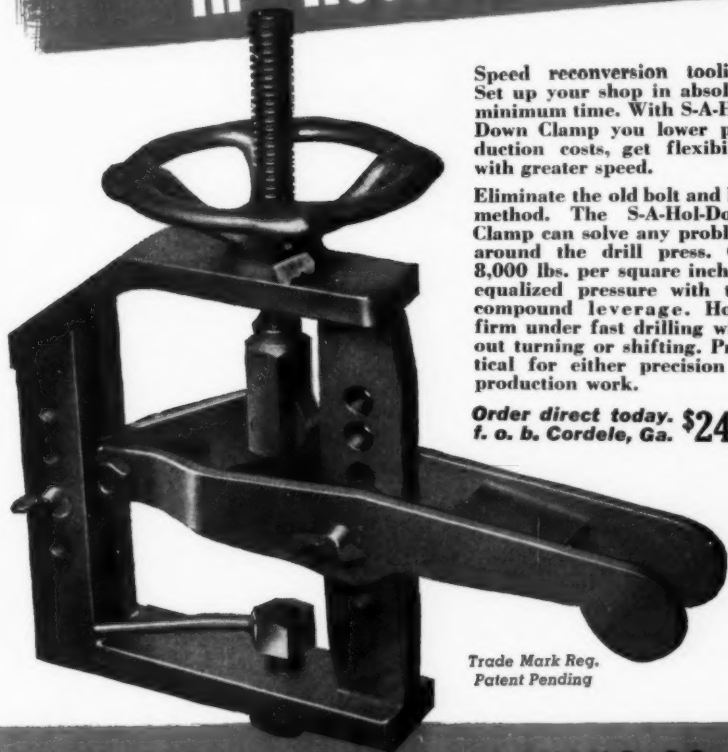
ROOFE MACHINE WORKS

5415 Harrisburg Boulevard

W. 31604

HOUSTON 11, TEXAS

S-A-Hol-Down Clamp Secures Work Pieces in Record Time!



Speed reconversion tooling. Set up your shop in absolute minimum time. With S-A-Hol-Down Clamp you lower production costs, get flexibility with greater speed.

Eliminate the old bolt and bar method. The S-A-Hol-Down Clamp can solve any problem around the drill press. Get 8,000 lbs. per square inch of equalized pressure with this compound leverage. Holds firm under fast drilling without turning or shifting. Practical for either precision or production work.

Order direct today. \$24⁵⁰
f. o. b. Cordele, Ga.

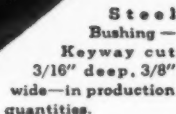
Trade Mark Reg.
Patent Pending

HARRIS FOUNDRY & MACHINE CO.
DEPT. B CORDELE, GEORGIA

KEYWAYS... 10 Times Faster

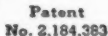
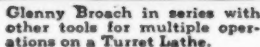
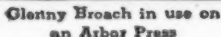
THE GLENNY

adjustable-expansion
Push BROACH



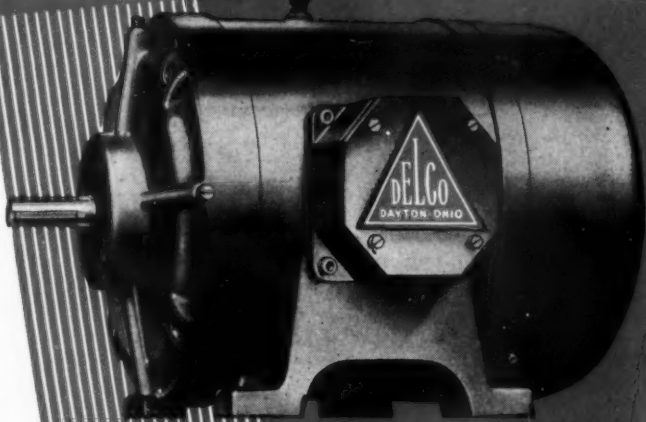
Broaches slots of greatest accuracy to an average length of five inches and up to 5/8" widths. May be used on Arbor Presses, Lathes, Screw Machines and other equipment.

The bushing illustrated was slotted with a Glenny Broach in one-tenth of the time required by a shaper for the same operation. Full information in Bulletin 9. Send for it today.



Cleveland 10, Ohio, U.S.A.

all wrapped up and ready to go



THE NEW DELCO MOTOR

OUTSTANDING FEATURES OF THE NEW DELCO MOTOR

Totally enclosed; fan-cooled.

Individually taped coils.

Thoroughly insulated windings.

Unit-cast ball-bearing rotor, dynamically balanced; parts interchangeable end to end.

Double-shell frame with new simplified cooling system.

Extra-large conduit box; can be made watertight by addition of gasket; usable in four 90° positions.

Extended, accessible mounting feet, cast as a unit with main frame.

When we say that this totally enclosed, thoroughly insulated motor is new, we mean new . . . in improved materials, in design practices, in maintenance ease and simplicity, and in cool-running, trouble-free performance.

Easier to attach to tools, and usable in four 90° positions, the new Delco motor is the answer to the production man's prayer for lower maintenance costs and less "down-time." Where machine tools operate under unfavorable conditions, the dirt and dust that clog open-type motors are no problem with this totally enclosed performer.

Don't specify another motor until you get *all* the data on the new Delco. It's yours for the asking.

DELCO

DIVISION OF GENERAL



MOTORS

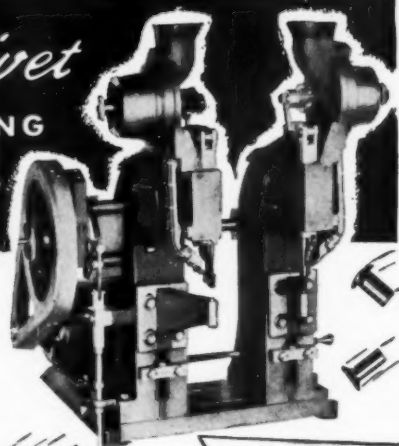
MOTORS CORPORATION

Chicago Rivet

AUTOMATIC SETTING

SLASHES UNIT COSTS!

If your product involves a fastening operation—wood to wood, metal to metal, fabric to fabric, composition to composition, or any combination of these—you can slash unit costs by increasing production volume with high speed Chicago Rivet Automatic Setters and Chicago Rivet tubular or split rivets. Four rivets are automatically fed, inserted and up-set at one release of the foot pedal by the quadruple model Chicago Rivet Setter. Single, double and triple setters are also available.



Bench type
Double Rivet
Setter with
Adjustable
Riveting
Centers

A Few Applications

AIRPLANE PARTS
AUTOMOBILE PARTS
BEAUTY PARLOR
EQUIPMENT
BED SPRINGS
BELTS • BICYCLES
CAMERAS
CAN OPENERS
CANVAS GOODS
CARD TABLES
CASH REGISTERS
CLOCKS
COFFEE POTS
DOOR LOCKS
ELECTRICAL PARTS
FAN BLADES
FARM IMPLEMENTS
FILING EQUIPMENT
FIREARMS
FOLDING CHAIRS
FURNITURE
GARBAGE CANS
HARNESS
INDUSTRIAL BROOMS
IRONING BOARDS
KNIVES
LAMPS
LAWN MOWERS
LEATHER GOODS
LOOSELEAF BOOKS
LUGGAGE
MILK BOTTLE CRATES
NOVELTIES
POTS, PANS & PAILS
PULLEYS
RADIO PARTS
REFRIGERATORS
RUBBER GOODS
SEWING MACHINES
SHOES • SEATES
STEP LADDERS
STOVES
TELEPHONES
TOASTERS • TOTS
TYPEWRITERS
VENTILATORS
WASHING MACHINES

Quick change hoppers, available as extra equipment, enable some models to switch quickly from one size and style rivet to another. Nearly all models clinch grommets, eyelets, staples and Dzus fasteners and insert drive screws—all automatically.

FREE FASTENING CLINIC

If your product is small, send us an unfastened sample. If it's large, send a sub-assembly. We will gladly analyze your fastening problem, recommend the type rivet and Chicago Rivet Automatic Setter needed and estimate production rates that can be set up on the job.

Chicago Rivet

CHICAGO RIVET & MACHINE CO.
9610 W. Jackson Blvd., Bellwood, Ill. (CHICAGO SUBURB)

"Our HYDRATROL
Lathe Does Better
Work at Lower Cost!"



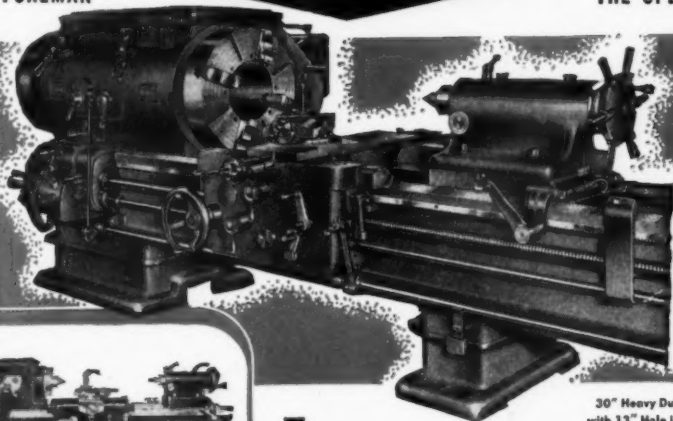
THE FOREMAN

Do it Better! on a HYDRATROL LATHE!

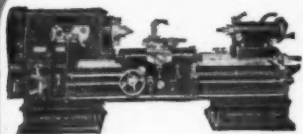
"Yes, and It's Easier
to Run, and Increases
Production!"



THE OPERATOR



30" Heavy Duty Lathe
with 13" Hole in Spindle



Standard Type, Heavy Duty HYDRATROL LATHES, 20" to 36"

The heavy 27" size, shown above, has all the ruggedness and power for the heaviest possible work. And its many refinements in design and construction result in an ease of operation comparable to small machines.

In hundreds of plants—under all sorts of conditions—LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

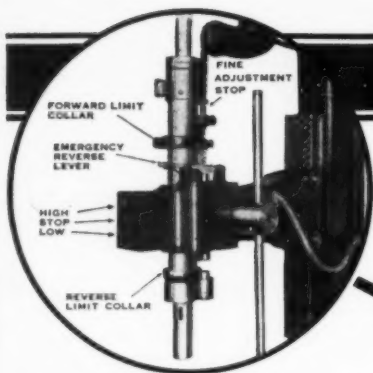
Look around your own shop—you may find a number of machining jobs which possibly could be done better on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

FIVE SIZES 18" to 36"

Small.....	18" up to 7 1/4" Hole
Medium.....	24" up to 12" Hole
Large.....	27" up to 13" Hole
Large.....	30" up to 14" Hole
Large.....	36" up to 16 1/2" Hole

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND... ST. LOUIS 3, MISSOURI



Avey

FEATURE No. 1

THE *Avey* TYPE MA-6 AVEY-MATIC POWER FED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

features

hand feed reversing motor for tapping

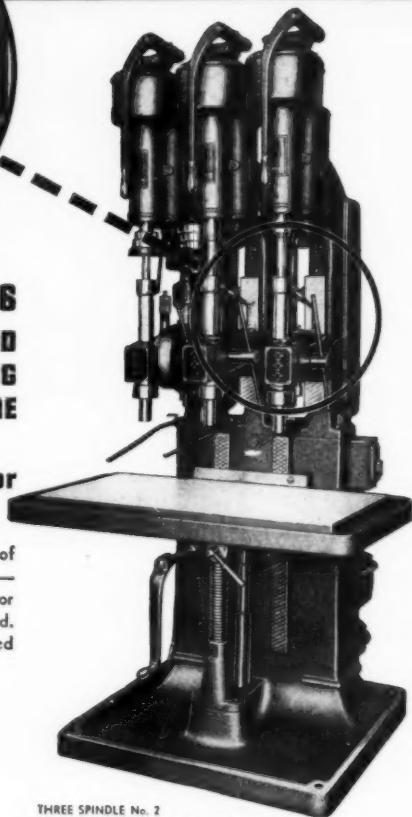
Dog control for depth — maintaining accuracy of depth within one-half revolution of the spindle — or emergency relief lever used to reverse motor if necessary before tapping cycle is completed. The natural motion of the spindle sleeve is used to control the reversing of the motor.

Type MA-6 is made in following capacities:

No. 2 — $\frac{7}{8}$ " capacity in cast iron.

No. 3 — $1\frac{1}{4}$ " capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE

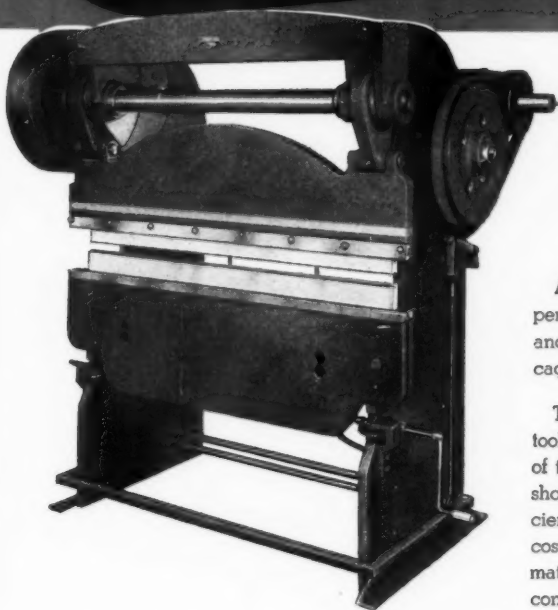
1st Spindle • Avey-matic Feed
2nd Spindle • Hand Feed
3rd Spindle • Tapping (Reversing Motor)



Avey

DRILLING
MACHINES

Powerful CHICAGO STEEL PRESS BRAKE



TYPE "300"

A POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

This money-saving production tool will handle 40 to 50 percent of the work done in an average shop. Greater speed, higher efficiency—much lower operating cost—plus the highest quality material and sturdy steel welded construction as in our larger machines.

We also build special machines for intricate bending operations.

Take advantage of our experience of over 45 years by sending to us any difficult bending problem you have.

—3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by 1½ h. p. motor.

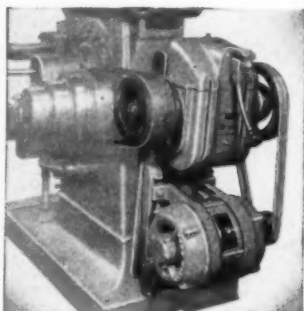
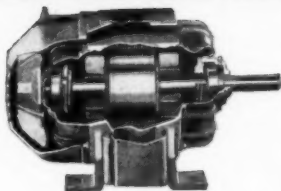
WORLD'S LARGEST MANUFACTURER OF HAND BENDING,
POWER BENDING AND POWER PRESS BRAKES

DREIS & KRUMP MANUFACTURING CO.
7440 LOOMIS BLVD. . . CHICAGO 36, ILLINOIS
SEND FOR NEW BOOK "FORMING PRESS DIES AND THEIR USES"

Speed PRODUCTION UP TO 25% WITH

TORQ MOTORS AND DRIVES

FOR LATHES • SCREW MACHINES
MILLING MACHINES • OTHER
STANDARD MACHINE TOOLS



PROMPT DELIVERIES

In most cases we can deliver within three or four weeks. And that means **early** speed-up of your production, thanks to modernization of your present equipment. With Torq drives and motors you may speed production up to 25%, and make the changeover so easily you lose no valuable production time in waiting. You will be prepared for post-war with completely modernized equipment.

ELECTRIC MOTORS: Totally enclosed, fan-cooled, anti-friction bearings.

TORQ-QUA-MATIC DRIVES: 4 selective speeds, 1 to 15 H.P., alloy steel gears, anti-friction bearings. Proven design . . . improves production up to 25%.

NOTE THESE LEADING USERS

Listed here are a few of the leading American War Plants which successfully use Torq Motors and Drives: White Motor, Cleveland Cap Screw, Cutler-Hammer, Republic Stamping, Valley Mould & Iron, H. B. Sacker Mfg. Co., Thompson Products.

Send for free descriptive catalog.



THE TORQ ELECTRIC
6605 CARNEGIE AVE.



MANUFACTURING CO.
CLEVELAND, OHIO

*"Sorry, but we won't meet delivery,
because our shaper burned out a
bearing, and it will take a week
to make repairs..."*

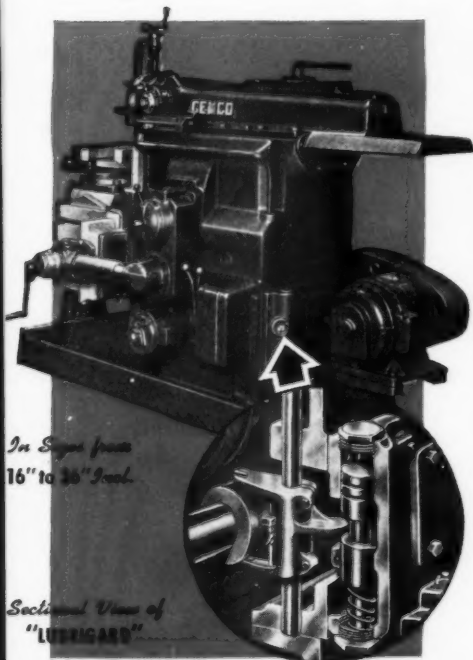


NO NEED TO WATCH OIL GAUGE! NO DANGER OF PRODUCTION DELAYS!

with "LUBRIGARD"
Safety Device of

GEMCO

Multi-Purpose SHAPERS



*In Sizes from
16" to 36" Travel*

*Sectional View of
"LUBRIGARD"*

Oil under pressure forces piston down, permitting projection on clutch control lever shaft to clear recess in piston, thereby allowing control lever to move into starting position.

The function of "LUBRIGARD" is to automatically prevent the ram of the shaper from being started:

(1) In case oil supply in reservoir is insufficient; (2) Should pressure in the system be below the minimum required; (3) Should a leak or failure of the oil pressure system occur; (4) Should the filter become clogged; (5) Should the drive pulley rotation be incorrect.

In addition, "LUBRIGARD" will prevent the clutch control lever from being engaged while the drive pulley is at rest. Therefore, should the motor be started, the ram will not move unexpectedly. This prevents injury to the operator, or damage to the machine or work piece.

"LUBRIGARD" assures long, satisfactory shaper performance, because of adequate, automatically-controlled lubrication of all bearing surfaces. It increases the Precision Life!

Write Today for Bulletin GC-12B

GENERAL ENGINEERING & MFG. CO., ST. LOUIS 4, MO

MANUFACTURERS OF PRECISION MACHINERY SINCE 1917

ONE *for* TWO jobs



**benchmaster OFFERS A
LOW-PRICED BENCH MACHINE
FOR BOTH HORIZONTAL
AND VERTICAL MILLING**

*benchmaster mill with
horizontal spindle overarm*

SAVES VALUABLE SPACE—CUTS DOWN EQUIPMENT COSTS

Now you can obtain a precision perfect, high-speed *benchmaster* milling machine that's easily convertible from a horizontal to a vertical miller by simply interchanging spindle attachments. Its *unusual* versatility, plus the *usual* quality-plus *benchmaster* workmanship, make this double-duty milling machine an outstanding addition to your shop.

SPECIFICATIONS: Table size—6" x 14"—Three Tee Slots $\frac{3}{8}$ ", 2" center Longitudinal travel 8 $\frac{1}{2}$ "—Traverse travel 5 $\frac{1}{2}$ "—Vertical travel 8 $\frac{1}{2}$ " on vertical mill—9 $\frac{1}{2}$ " horizontal mill—Height 28"—Weight (less motor) 215 lbs.—Requires $\frac{1}{3}$ h.p. motor—Spindle speeds (standard 1725 rpm motor) 450-850-1400-2100 rpm.

benchmaster

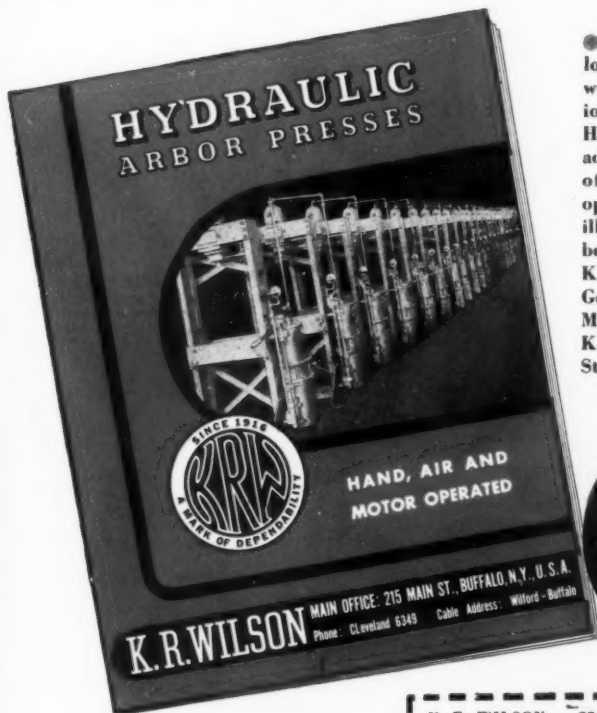
MANUFACTURING COMPANY
2852 WEST PICO BOULEVARD
LOS ANGELES 6, CALIFORNIA



NEW KRW

HYDRAULIC PRESS BOOK

of Profitable Production Ideas



● This is more than a catalog... it is a textbook of workable, practical suggestions on how low-cost KRW Hydraulic Presses can be adapted to solve a myriad of everyday production operations. 32 completely illustrated pages that show both standard and special KRW Presses in operation. Get your Free Copy now... Mail the coupon at once. K. R. Wilson, 213 Main Street, Buffalo 3, N. Y.

NOW AVAILABLE
AS
HAND OPERATED
ELECTRIC OPERATED
AIR OPERATED
Presses...

K. R. WILSON
BUFFALO 3, NEW YORK

K. R. WILSON, 213 Main Street, Buffalo 3, N. Y.
Please mail me a copy of your New
Hydraulic Arbor Press Catalog.

Name.....

Address.....

City & Zone.....

State.....

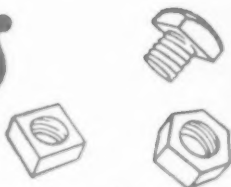
13

NEW...AND READY FOR IMMEDIATE

PNEUMATIC

IMPACT WRENCH

by *Thor*



MORE POWER—for *Faster, Positive Driving and Removing of Nuts, Bolts and Cap Screws.*

LONGER LIFE—through *amazingly simple, sturdy, new impact mechanism.*



EASILY THE MOST POWERFUL tool of its class, the new THOR Reversible Impact Wrench quickly and surely *drives and removes* nuts, bolts and cap screws up to $\frac{3}{4}$ ". Light and compact, it is easy to handle even in hard-to-reach places. Pneumatic powered, it is extremely simple in construction for long life and fool-proof operation.

A revolutionary, new impact mechanism—exclusive with Thor—delivers *direct* blows that *automatically* assure maximum

striking power. The tool *stays on the job longer without losing its original impact force!* Simplified design lessens stress and provides smoother operation—to reduce wear and increase tool life.

Ready now for immediate delivery. Your nearest Thor branch or representative will be glad to arrange an early demonstration.

INDEPENDENT PNEUMATIC TOOL CO.
600 W. Jackson Blvd., Chicago 6, Ill.

BIRMINGHAM BOSTON BUFFALO CLEVELAND DETROIT LOS ANGELES
MILWAUKEE NEW YORK PHILADELPHIA PITTSBURGH ST LOUIS
SALT LAKE CITY SAN FRANCISCO TORONTO, CANADA LONDON, ENGLAND

DELIVERY!



GRIP THROTTLE
Model No. 6

SMALLEST, LIGHTEST TOOL OF ITS CLASS!

**HERE'S FULL POWER
... LONGER!**

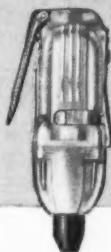
- New THOR high-power impact mechanism provides direct, positive drive to the impact spindle.
- Stress is lessened on the working parts by placing the two impact jaws at a wider radius to the spindle center.
- Because a new face for each jaw is *rotatively* delivered to the anvil for each blow, the impact jaws *naturally* wear longer.
- Short, rigid, spindle shank delivers blow close to the work.

**HERE'S HANDLING
EASE!**

- The lightest, smallest tool in its class—3¾ pounds, 5¾ inches long.
- Torque reaction to the operator is *practically* eliminated.
- Motor reverses quickly, simply by pressing convenient side button.

**AUTOMATIC
LUBRICATION!**

- Oil reservoir in handle automatically feeds proper amount of lubricant to motor with compressed air.



LEVER THROTTLE
(Optional)

Coming Soon!

**MORE NEW THOR
IMPACT WRENCHES**
—in ½", ¾", 1" and
1½" CAPACITIES.
Watch for Them!

Thor PORTABLE POWER
TOOLS

**PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY
ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS**



"I've got a
'Sweet' Job Now!

... but even though it's
chocolate coated, I have
to be able to take it."

says Tommy Universal

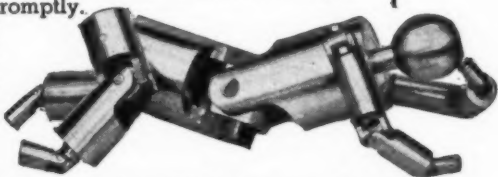
I. W. Greer Chocolate Coating Unit driven by special bored and keywayed $1\frac{3}{4}$ " Curtis Universal Joint in the off-set line shaft coats 3500-4000 lbs. of nougat centers per hour.

Whether for machine tools, airplanes or special type equipment such as illustrated above, *There is a correct CURTIS UNIVERSAL JOINT for every purpose.*

A Curtis Universal Joint can be supplied to meet YOUR particular specifications or requirements.

14 standard sizes — both solid and bored — are in stock. Special hub boring, keying or other variations or adaptations can be furnished promptly.

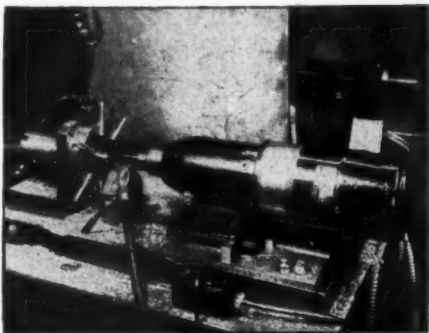
Our Engineers are ready to give your problems the benefit of our years of experience in making industrial universal joints, exclusively.



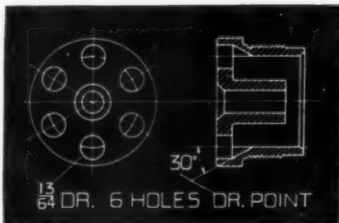
Write for technical data and useful Engineering Templates.

C CURTIS UNIVERSAL JOINT CO. INC.
DEPT. B-1 4 BIRNIE AVENUE • SPRINGFIELD 7, MASS

New **MODEL "K"** **SPEEDS UP DRILLING !**



**1200 Holes
Drilled
Per Hour
(Including
Loading
and
Unloading
Time)**



Drilling 6 holes, 13/16" diameter, in each part with a 30° drill point, at the rate of 4 pieces per minute, including loading and unloading time — this high production is achieved by one New Model "K" Automatic Drilling Unit, installed on hand-indexing fixture at McLaren Screw Products, Detroit.

If you are seeking new ways of reducing drilling costs to meet present-day conditions, get the facts about this new piece of production equipment that is bringing production costs down to a new "low".

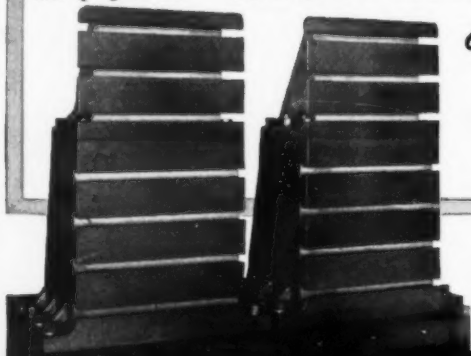
Designed for drilling up to 3/4", depending upon the material. Send blueprint or part for our recommendation as to your particular drilling problem. No obligation.

**WRITE FOR
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A *New* HIGH IN A COMBINATION of MATCHED *Angle* BLOCKS!

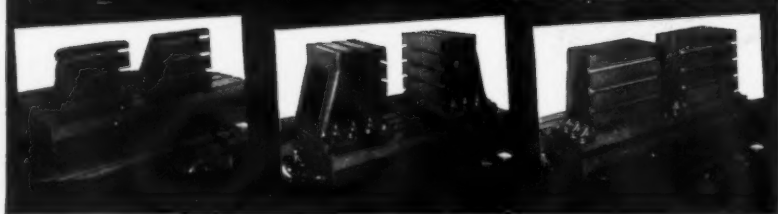


TOP MEMBERS—Vertical Face—12" High, 16" Wide—3 Tee Slots.

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TOP FACE—12" Deep, 16" Wide—3 Tee Slots.

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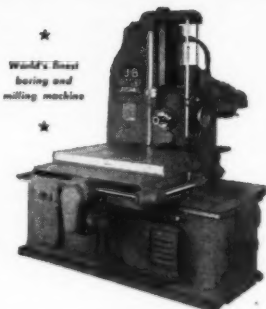
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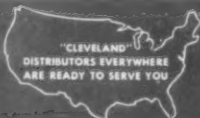
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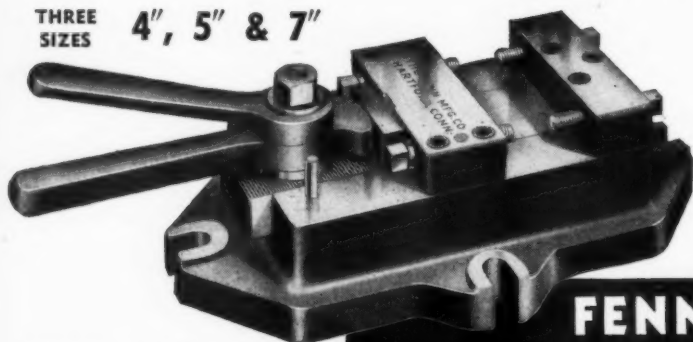
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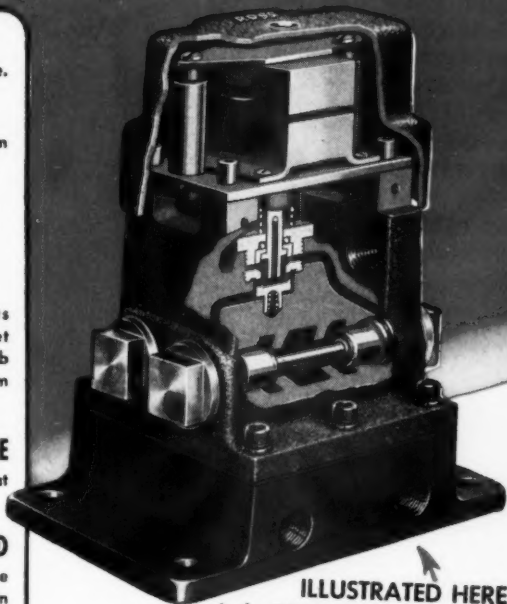
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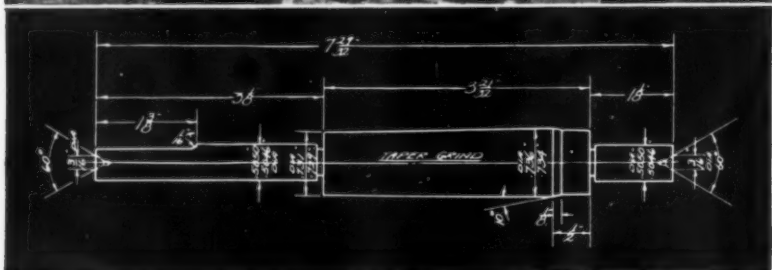
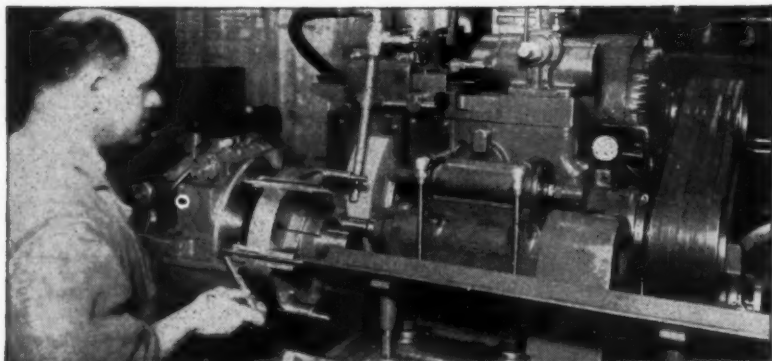
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Speeds	65, 93, 120, 149 S.P.M.	65, 93, 120, 149 S.P.M.
Height of Table	22"	22"
Height Over All	66"	63"
Floor Space	5'6"x3'2"	5'5"x3'7"
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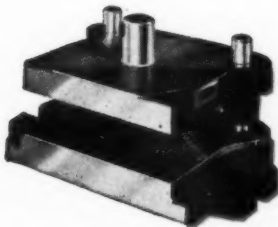
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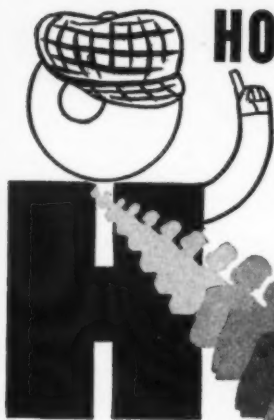
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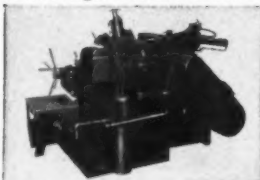
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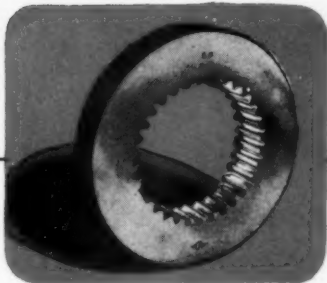
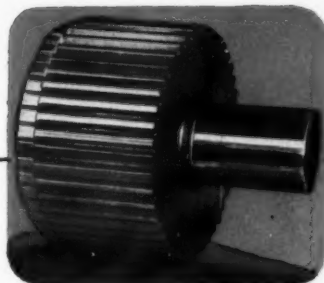
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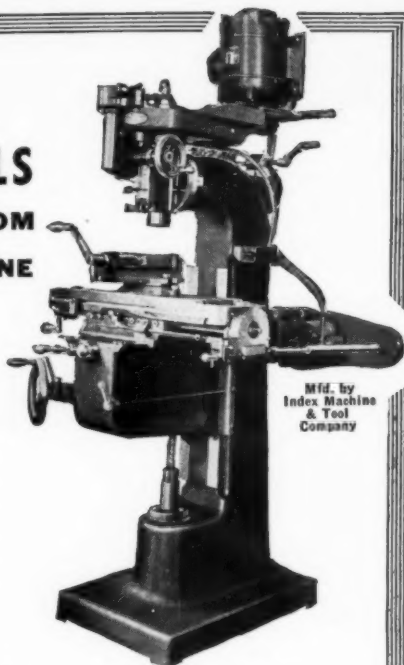
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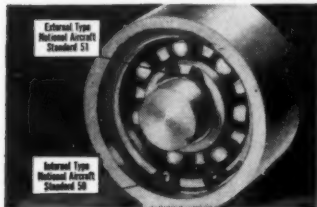


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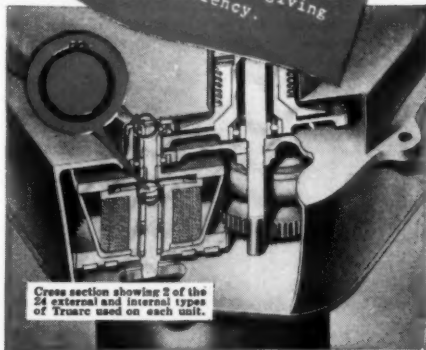
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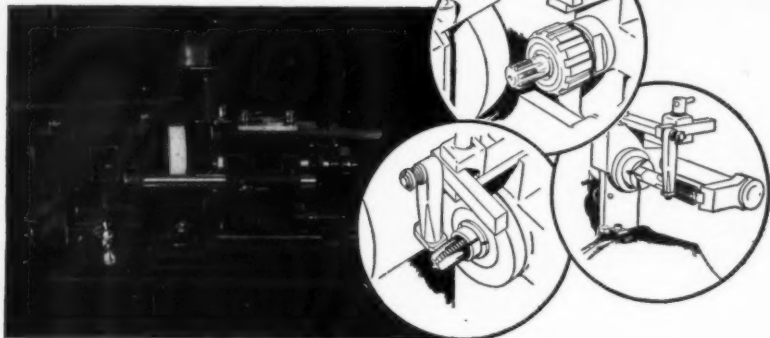
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Grinds the chamfer angle and the relief on all the flutes in one continuous operation.

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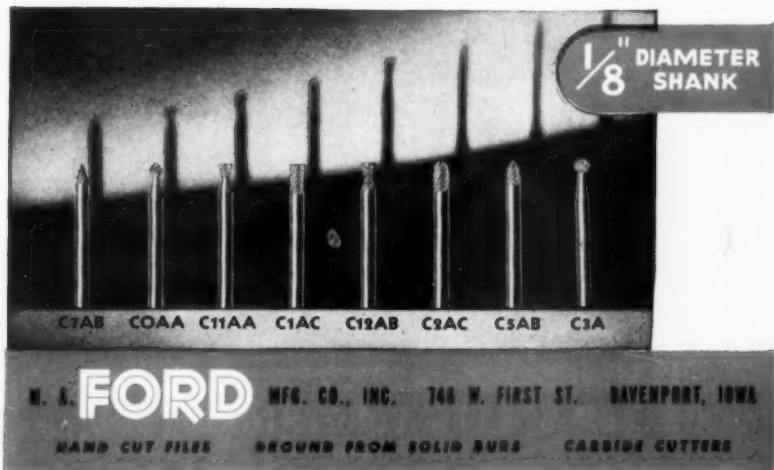
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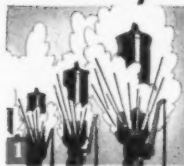
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For internal or external grinding. Ball bearing grinding wheel spindles interchangeable on corresponding sizes. For use with lathe, planer, boring mill, milling machine, etc. Vertical or horizontal position. Spindles equipped with matched precision ball bearings in dust-proof housings.

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3 It's the WOODWORTH ADJUSTABLE THREAD Ring Gage.



4 Thread ring gages check the outside dimensions of threaded parts.



5 Adjusting 'em as they wear down saves time and money.



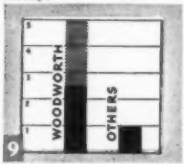
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9 Wears 2 1/2 to 5 times longer—With equal distribution of wear.



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THE NEW Adjustable Thread Ring Gage, another revolutionary Woodworth instrument of accuracy, is now available to industry!

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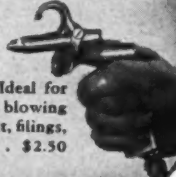
Plants: New York • Chicago • Los Angeles



GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

Seeking faster production methods, busy plants have discovered new, powerful Speedy Air Vises! From a single vise to an installation of fifty, they cut time, money and labor costs. Air operated, *foot-controlled*, both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. Complete with Foot **\$24** Control Valve, Air Hose and Fittings, only

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 <p>AIR REGULATOR Precision-built. Delivers pressures up to 140 lbs. With gauge, \$4. Less gauge, \$2.50</p>	 <p>AIR FILTER Keeps water and particles out of the regulator and pneumatic tools. \$1.50</p>	<p>BLOW-GUN Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . \$2.50</p> 
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POWER-DRIVE SMALL SCREWS

Fast!



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ARO does it *first* again—introducing the *first and only* power screw driver specifically built for small screws!

The sensational new ARO Model 7000 Screw Driver is no bigger than the average cigar! A "feather-weight" performer with big power... weighs only 8 oz. . . is 4 1/4" long and 3/8" in diameter. Capacity No. 1 to No. 6 screws. Starts automatically—no manual throttle. Just touch it to the work and *presto*—the screw is driven!

Whatever your need in power tools . . . for screw-driving, nut-setting, drilling, grinding and scores of other production jobs . . . specify ARO! Precision-built for top-speed, trouble-free performance. Write for catalog. The Aro Equipment Corp., Bryan, Ohio.

Specify **ARO** *Pneumatic*
TOOLS



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MANUFACTURING**

You Will Find

REID PRECISION SURFACE GRINDERS BUILT TO HANDLE YOUR WORK IN AN EFFICIENT AND TIME-SAVING WAY. EVERY POSSIBLE IMPROVEMENT HAS BEEN MADE TO ASSURE YOU CLOSE TOLERANCE AND A FINER FINISH AT LOWER COST. ALL WORKING PARTS ARE DESIGNED AND FITTED TO PREVENT ABRASIVES FROM PENETRATING AND CAUSING UNDUE WEAR. ACCESSIBILITY AND NEW DESIGN OF HANDWHEELS ASSURE YOU ACCURATE FINGERTIP CONTROL. AN OUTSTANDING PRECISION MACHINE.

BALANCED DESIGN - ATTRACTIVE FINISH.
MODERATE COST.

ILLUSTRATED IS THE REID
MODEL 2-B ALL-ELECTRIC POWER FEED.

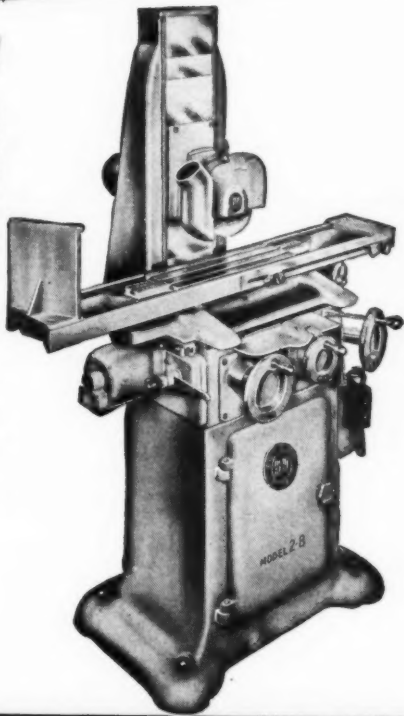
THE REID MODEL 2-C HAND-FEED ALSO IS AN EXCEPTIONAL MACHINE FOR TOOL, GAGE, DIE AND CERTAIN PRODUCTION GRINDING.

MACHINES EQUIPPED FOR WET GRINDING IF REQUIRED.

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RUN AS TRUE
AS THE SPINDLE



*Diamond
Grip*

STOPS SLIP

Style "F"


Full Floating Master Collet with Interchangeable, Replaceable Jaws. For Hot Rolled Stock.

- Each jaw floats independently with full bearing on stock.
- Jaws grip tightly with one-third less tension.
- Jaws made with patented Diamond Grip Serrations.
- Prevents slippage—reduce scrap—reduce strain.
- One master per machine—jaw assortment for full range.
- Jaws quickly, easily changed—saving set up time.

"Only Sutton Collets Are Diamond Serrated"

SUTTON TOOL COMPANY STURGIS, MICHIGAN

SUTTON  COLLETS




S's for Service

"S" is for the Service you receive from Winter Taps, the extra holes per grind, the clean-cut threads, the extra long useful life. "S" is also for the Service and close cooperation you receive from the Winter Brothers engineering staff in working out new tapping problems and new techniques.

S also stands for another Service

— the prompt Service you receive from your local mill supply man who is familiar with your problems and is always ready to help you. He is as near to you as your phone. "S" also stands for the full Stock of Winter Taps he carries on his shelves ready for immediate delivery. For Service with a capital "S" always specify Winter Taps — from your local distributor.

Winter Brothers

COMPANY  Wrentham, Massachusetts, U.S.A.
BRANCHES: SAN FRANCISCO, CALIFORNIA; CHICAGO, ILLINOIS; DETROIT, MICHIGAN
A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN

CROBALT CUTTING QUALITIES

*Remain Constant
at High Temperatures*



At temperatures up to 2000 degrees, the cutting qualities of Crobalt tool bits remain constant. This allows faster cutting and contributes to increased tool life between grinds.

Crobalt is a balanced, non-ferrous alloy containing principally chromium, cobalt, tungsten, vanadium, zirconium, and carbon. Crobalt's resistance to chipping or breaking is considerably greater than carbides. Engineered for high speed production. Perhaps Crobalt is the answer to your problem—at least it should be worth trying.

Crobalt bulletin No. 45 contains valuable technical information and quotes prices on standard size tool bits—Send for your copy.

CROBALT INC.

1360 North Main St. Ann Arbor, Michigan

Make *SPEED*



← ON JOBS LIKE THIS...
use a **CLEVELAND**

SINGLE SPINDLE AUTOMATIC MACHINE. This $2\frac{1}{16}$ " internally threaded brass ferrule sets up for fast production on a Cleveland with these operations . . . Station one gauges stock . . . 2 rough c-bores 1.860" ID, $2\frac{1}{4}$ " deep (see clean, steady cut indicated by chip action pictured above) . . . front cross slide faces and form-chamfers front end of work . . . station 3 finish c-bores (three steps) and

chamfers front of ferrule . . . rear cross slide form-chamfers back end . . . 4 carries the $1\frac{1}{2}$ " x 12P tap, and the job is delivered by the independent cutoff. This is an every-day sort of a job for Cleveland Automatics, soundly economical because of their simple set-up facilities and high speed with multiple tooling. Let us send you a bulletin describing Cleverlands in capacities from $\frac{5}{16}$ " to $9\frac{1}{2}$ ".

Cleveland also makes high-pressure hydraulic diecasting machines. Get a bulletin.

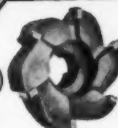
THE CLEVELAND AUTOMATIC MACHINE CO.

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BRANCHES: Chicago • Detroit • New York • Cincinnati • Hartford

NELCO Carboly-Tipped CUTTING TOOLS

TAGGED FOR
Faster
PRECISION Production



Shell Mill

**HEAVY, RUGGED
BRAZED-IN
TYPE WITH
HIGH-STRENGTH
BODIES**



**70% INCREASE IN
NUMBER OF PIECES
MACHINED PER
GRIND**

End Mill

With #50 Taper Shank



Face Mill

**DESIGNED
FOR
FLYWHEEL
ACTION**

Half Side Mill

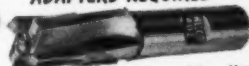


**LESS
TIP
BREAKAGE**

Side Mill



**FOR MOUNTING ON STANDARD
EQUIPMENT—NO SPECIAL
ADAPTERS REQUIRED**



End Mill

Two and Four Flute
Straight and Taper Shank

**ALL CARBOLOY TIPPED
END MILLS
REDUCED 10%
IN PRICE!**



**SAVE Hundreds of Valuable
PRODUCTION HOURS
By Giving The NELCO
FIELD ENGINEER
A Few Minutes Time!**

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TOOL CO., INC.

For That **EXTRA EDGE** In Production

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Any One Of These Well Known Distributors Will Be Glad To Help You

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Write for additional detailed literature.

Engineered Hole Location Service

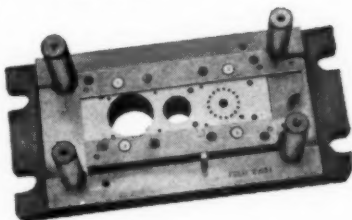
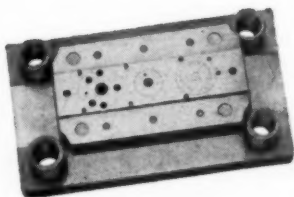
Prolongs Die Life

Electrical lamination stampings are tough on dies. With thin abrasive stock to be cut in enormous quantities, absolute uniformity in the small punch and die clearances is a "must."

Here's how the Moore Jig Borer and Moore Jig Grinder team up to pay dividends in the toolroom and assure 25% to 100% added die life:

Both machines work to pre-engineered dimensions, enable all parts of the die to be made to figures instead of to "fit." Coordinate calculations, set up in the engineering department, can be used throughout in boring the soft pieces in the Moore Jig Borer and finish-grinding the hardened parts in the Moore Jig Grinder. And all parts of the die can be made concurrently by several toolmakers on an interchangeable parts-and-assembly basis instead of progressively as a one-man job.

Study the table below and consider how this Engineered Hole Location Service built around the Moore Jig Borer and Moore Jig Grinder can lower your tool costs...increase the capacity of the toolroom...speed new dies to your pressroom. Then ask a Moore sales engineer to stop by and answer your questions in detail.



HOW MOORE JIG BORER AND MOORE JIG GRINDER PROMOTE INTERCHANGEABILITY IN THE TOOLROOM

1. *Moore Jig Borer spots, drills, bores or reams all holes with minimum tool changes.*
2. *Moore Jig Grinder relocates holes in hardened parts by finish-grinding.*
3. *Accurate Lead Screw Measuring Principle in both machines assures precise, rapid table settings within .0001" by coordinate location.*
4. *Coordinate calculations made by engineering department are used throughout in boring and finish-grinding to figures instead of to "fit."*
5. *Soft and hardened parts are made concurrently, not progressively. Errors in hardened parts are corrected, not retained and transferred to other parts.*
6. *Both machines inspect own work without disturbing set-up.*



MOORE JIG BORER  **MOORE JIG GRINDER**

MOORE SPECIAL TOOL COMPANY, INC. • 728 UNION AVENUE, BRIDGEPORT 7, CONN.

LOOK! Another **SUPER** Achievement



LOOK! AN EJECTOR TYPE TOOL BIT WITH LONG SOLID CARBIDE INSERT!

Get long tool life and low production costs with this new Super Tool. No outside tip holding mechanism—no interference with chip flow or assembly in tool block. No brazing strain, as carbide tip is held entirely by mechanical means.

A heavy section of well supported Carbide allows heavy cuts without cracking.

You get double tool life . . . the compound angles used permit light regrinding cuts on top, side and end, which produce a new sharp cutting edge with minimum loss of Carbide.

The Super Ejector Type Tool Bit works like an ejector lead pencil . . . the Carbide is mechanically held. Each holder can be used for any material. Long Solid Carbide replaceable bits, ground for any specific purpose, are available in suitable grades.

**Whatever Your
Cutting Job, Look
First to *SUPER***

Carbide tipped tools for
Turning, Facing, Reaming,
Milling, Forming, Spot Fac-
ing, Boring, Grooving,
Grinder Rests, Wear Parts,
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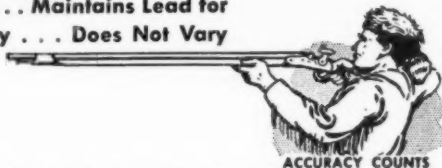
SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

THE AMERICAN HOLE CHECKER PIONEER

In the Field of Air-Operated
Gages . . . Maintains Lead for
Accuracy . . . Does Not Vary



ACCURACY COUNTS



HOLE CHECKER UNIT
mounted on Space-Saver
Pedestal accessory for
easy positioning at any
place in shop and quick
adjustment to right
height.

When the American Hole Checker first made its bow to industry in 1937 there was nothing else like it on the market. Since then refinements have been made, based on the requirements of many types of users, but basically it was from the first, skillfully designed and soundly engineered.

So the air-operated unit you get today is time-tried and dependable for I. D. checking. With an O. D. accessory unit, it may also be used for outside diameter checking.

The Hole Checker is the ideal gage for both production and inspection. It is quickly set up—easily read—and it does not vary. Accuracy to .0001". The standard Hole Checker unit is used with one special sizing plug for each hole checked. Unit is set for gaging parts by means of two master ring gages.

Send parts prints for
quotation. Write for
new catalog and prices.



The AMERICAN GAGE & MFG. CO.
125 Bayard St. DAYTON 1, OHIO

ACRO



Die set pullers

GONE FOREVER — battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay.

Use **ACRO PULLERS** for safe sure separation. They are fast — accurate — positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

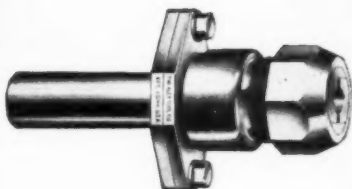
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ALCO

RELEASING MODEL TAP HOLDER



Please write for
new complete
Catalog No. 6.



The operator of hand screw machines and turret lathes has but one thought in mind — to produce perfect work with the minimum amount of effort.

ALCO Releasing Type Tap Holders lend themselves admirably to making this an established fact. The solid clutch drive, the concentric alignment of the tap with the hole, the rugged construction of the ALCO tool make this the most outstanding and fool-proof tap holder of all the releasing types. Designed especially for heavy duty work and for cutting threads to the most exacting standards.

The quick and positive alignment of the tap for concentricity saves valuable time in setting up and the fact that wear on the tap is evenly distributed lengthens tap life and prevents breakage.

The most convincing method of proving that ALCO Releasing Tap Holders will save time and improve work produced is to install just one of them on your next set-up. Please write for complete engineering data and prices.

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EFFICIENT

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Our 3 POINT POLICY

Insures Lower Production Costs for YOU

QUALITY *Precision Built*

DIES • FIXTURES • JIGS • GAUGES AND

1. *Engineered for maximum
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2. *Built Right*

3. *Priced Right*



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★ Every tool we design and build

must measure up to this yardstick. If you need tools to get work out F-A-S-T and without interruption, drop us a line TODAY!

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MOTOR TOOL

*Multi Spindle
High Speed*

TAPPING MACHINE



with the INTERCHANGEABLE HEAD

*An important NEW development that enables
ONE machine to do the work of many*

No longer is it necessary to buy and set up individual machines for each individual tapping operation. By simply changing the head, every tapping job within its capacity can be handled with this ONE machine. It will tap out a single hole—or a dozen—in any pattern—provided the work is confined to a 10" x 12" area. Center distances, between spindles, can be held as close

as 1". It will do the work with precision and accuracy. It will do it automatically—at high speed—with one operator in place of many. No expensive outlay for additional machines. No idle machines between jobs. Operator's time is utilized to the utmost. Floor space is conserved. Simple, dependable operation—with assurance of uniform, accurate work.

Write—at once—for descriptive folder.

MOTOR TOOL MANUFACTURING CO.
METAL CUTTING TOOLS

7773 CORTLAND AVENUE • DETROIT 4, MICHIGAN

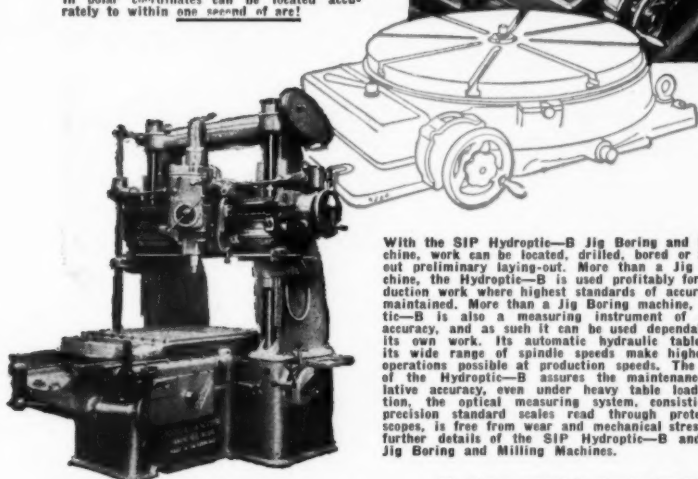
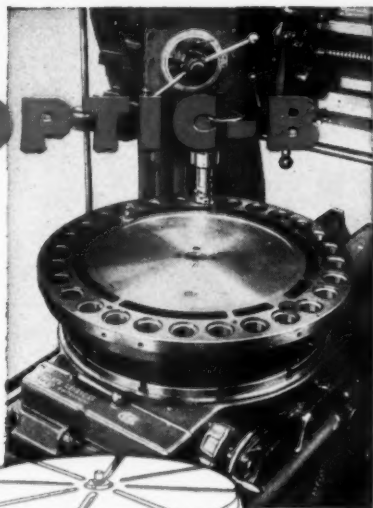
*Make it a Rule
to Call Motor Tool*

LOCATING AND BORING
28 PRECISION HOLES
WITHIN 1 SEC. OF ARC ON THE

SIP HYDROPTIC-B

*-no preliminary
laying out! -no jigs
or fixtures!*

All 28 holes on the part shown at the right were bored at one setting on the SIP Hydroptic-B . . . without jigs and without preliminary laying out! The unique optical setting feature of the SIP Hydroptic-B Jig Boring and Milling Machine permits laying out in rectangular coordinates to within 0.0002" limits of accuracy of setting of table and spindle. And, with the circular dividing table, work dimensioned in polar coordinates can be located accurately to within one second of arc!



With the SIP Hydroptic-B Jig Boring and Milling Machine, work can be located, drilled, bored or milled without preliminary laying-out. More than a Jig Boring machine, the Hydroptic-B is used profitably for direct production work where highest standards of accuracy must be maintained. More than a Jig Boring machine, the Hydroptic-B is also a measuring instrument of unquestioned accuracy, and as such it can be used dependably to check its own work. Its automatic hydraulic table feeds and its wide range of spindle speeds make highest precision operations possible at production speeds. The construction of the Hydroptic-B assures the maintenance of superlative accuracy, even under heavy table loads. In addition, the optical measuring system, consisting of high precision standard scales read through protected microscopes, is free from wear and mechanical stress. Write for further details of the SIP Hydroptic-B and other SIP Jig Boring and Milling Machines.

RANGE OF TABLE SIZES

No. 2C	18" x 10 1/2"
No. 3K	21 1/2" x 15"
No. 4G	27 1/2" x 23 1/2"
No. 5G	43" x 32"
Hydroptic-B	39 1/2" x 32"

HIGH PRECISION MACHINE TOOLS

C O S A
CORPORATION



AND MEASURING INSTRUMENTS

CHRYSLER BUILDING
New York 17, New York

We also represent in the United States other world-famous Swiss High Precision Equipment: Andre Bechler—Maag Gear Wheel Co. — Mikron — Safag — Studer — Sallaz — Schaublin — Lienhard — Billieter



DUST IS NO JOKE

TORIT

DUST COLLECTORS

trap dust at its source . . . protect valuable machinery and workers' efficiency

TORIT Dust Collectors are self-contained, portable, and easy to install. They save fuel by returning filtered air to the room.

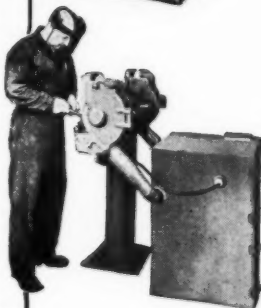
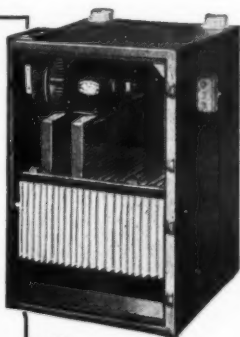
Nearly 10,000 TORIT Dust Collectors, ranging from $\frac{1}{3}$ HP to 3 HP, are in use. They fit every production plan, and have paid big returns in plant cleanliness and employee efficiency.

Write for TORIT Dust Collector Catalog No. 30 giving full information on the different size units.

TORIT MANUFACTURING CO.

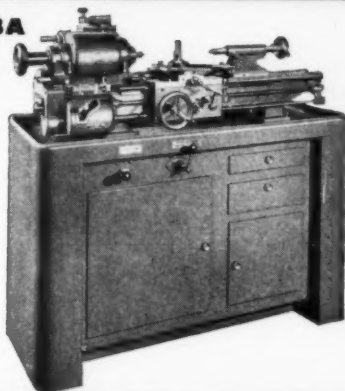
303 Walnut Street

St. Paul 2, Minn.



ADMINISTRATOR

the Wade No. 8A toolmakers' lathe...



has such features as ...



1. A spindle supported by an SKF double row cylindrical roller bearing plus two heavy duty precision roller bearings, all preloaded.
2. Especially designed collets, tools, and attachments to insure enduring accuracy and long life.
3. Rugged, exact construction throughout every part and every assembly.

which result in ...

1. A spindle of greater rigidity permitting heavier cuts, smoother finishes, greater accuracy, and increased production.
2. Longer precision ground collet bearing surfaces that assure true running throughout a long life—a greater range of regular turning operations plus grinding and the turning of odd shapes.
3. An ability to turn out tools and parts with a degree of precision not usually possible in larger, or smaller, machine tools.

These advantages, plus twelve spindle speeds from 35–2000 R.P.M., lead screw accuracy of $\pm .0005$ per foot of lead, a unique, quick-operated, belt-shifting mechanism—and extremely sensitive control all add up to make the Wade No. 8A Toolmakers' Precision lathe a highly productive, extremely accurate machine tool with an exceptional stamina that means extra years of profitable operation.

The Wade Tool Co.
51 RIVER ST.
WALTHAM 54, MASS.

THE WADE TOOL CO.

51 River Street
Waltham 54, Mass.

Please send me without obligation your Catalog giving complete details on the Wade No. 8A Toolmakers' Lathe.

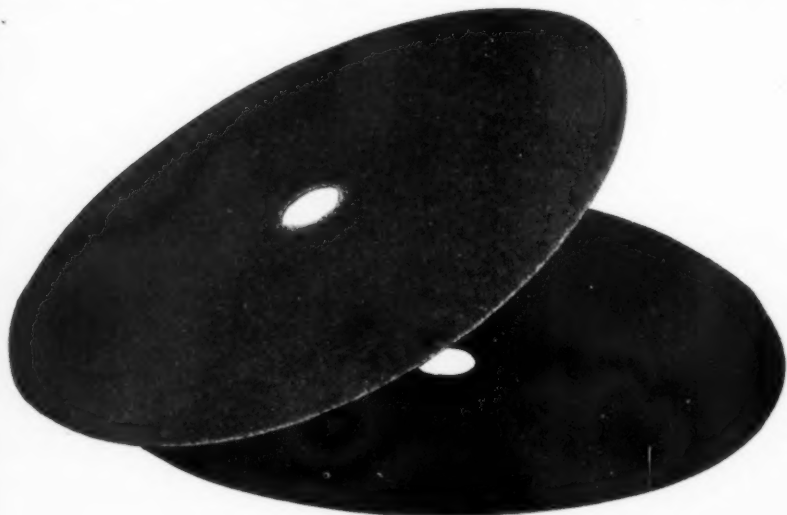
Name Title

Company

Street

City State

SPEED-WET *and* RESINIZED



TWO *NEW* METALITE DISCS

Announcing—for immediate release—two new RESIN-TYPE Metalite Fibre Discs—developed under war-time research for accelerated peace-time production.

SPEED-WET METALITE—green backing—extra heavy duty with extreme flexibility.

RESINIZED METALITE—brown backing—heavy duty, all purpose.

Combining the heat and humidity resistance of the Behr-Manning Durabonded process with the extra toughness and stamina of the resin treatment, Speed-wet and Resinized Metalite Fibre Discs are truly masterpieces of research in postwar disc manufacture. Production improvement, demonstrated in extensive field tests against first grade discs, averages 50 to 100%.

For increased production yield, you are urged to test these new discs on all portable disc grinding jobs at once. Instruct your distributor to include a test quantity of Speed-wet and Resinized Metalite Fibre Discs with your next order.



BEHR-MANNING • TROY, N.Y.

MANUFACTURERS OF QUALITY COATED ABRASIVES SINCE 1872

**Where 500 pieces per grind is
really**
Something

A **FIRTHITE**

application



Conditions:

Depth of cut - 3.32"

Feed per revolution - 0.016

Cutting speed - 250 feet per minute.

Turning, facing and chamfering a cast iron sleeve with Firthite sintered carbide tools on this job just meant about five times as many pieces per grind. Better production, less downtime, uniformly better products and a big reduction in grinding costs were the results.

If you have a cutting problem:

Call

Firth-Sterling
STEEL COMPANY

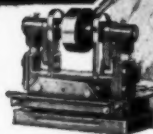
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METAL Stampings

**DUPLICATED
WITHOUT
DIES**

With DI-ACRO Precision Machines

If you desire to save time and die expense on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.



SHEARS



BRAKES



BENDERS

SHEARS

Di-Acro Shear squares and sizes material, cuts strips, makes slots or notches, trims duplicated stampings. Shearing width—Shear No. 1—6". Shear No. 2—9". Shear No. 3—12".

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Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No. 2—12". Brake No. 3—18".

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Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity—Bender No. 1— $\frac{3}{8}$ " round cold rolled steel bar. Bender No. 2 and No. 3— $\frac{1}{2}$ " cold rolled steel bar.

Send for Catalog

**"DIE-LESS
DUPLICATING"**

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



◀ Pronounced "DIE-ACK-RO"



O'NEIL-IRWIN MFG. CO.

314 Eighth Ave. So.
Minneapolis 15, Minn.

More Speed...
LONGER DRILL LIFE
 with **CONTINENTAL'S**
New **DRILL CHIP**
BREAKER

Faster drilling action and prolonged tool life are but two of many advantages obtained with the Continental Drill Chip Breaker. By breaking chips into small, uniform pieces that are easily carried up the flutes of the drill, clogging is eliminated. The unit can be used vertically, horizontally, or at any angle as long as the housing can be kept stationary while the drill rotates. The arm prevents rotation of the housing. Where space permits, the Continental Drill Chip Breaker can be used in multiple spindle heads. Write for Continental Bulletin 28161 for sizes, complete specifications and 7 ways to profit by this new Continental product.



With the Continental Drill Chip Breaker, the chip is broken at regular intervals. Small loose chips are easily carried up the flutes. Holes are straighter, rounder, and have better wall finish.



CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

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**ONE OF THE MOST
USEFUL TOOLS
IN OUR SHOP**

**... SAYS THIS
SUPERINTENDENT**

"We have a Univ-Angle on every grinder that we use for angular work as well as several in the inspection department and a couple on the jig borers.

They save us several hours apiece every week. The boys on the machines like Univ-Angle because it helps them to do good work. Univ-Angle is accurate and easy to read and since there are no dials or scales to misread it is practically foolproof."

Shop superintendents all over the world indorse Univ-Angle as the fastest, most accurate method of making all types of single and compound angle set-ups. Univ-Angle uses standard gage blocks to determine angles positively. The Univ-Angle itself is made to the closest limits. The work is held by magnetic attraction for quick clamping and quick release and there is no pressure to distort the work or the set-up.

Learn more about this versatile, time-saving tool and how it can save time and money in your tool room. Write today for complete information.



Robbins ENGINEERING COMPANY

318 MIDLAND AVE.

DETROIT 8, MICHIGAN

ROTO-CLONE

with
**FILTER
AFTER
CLEANER**

„solves grinding dust problems

Where individual machines create a dust nuisance, *Roto-Clones equipped with AAF filter after-cleaners are the perfect answer to the problem. Exhaust hoods and ducts are simple and easy to install and the cleaned air may be returned to the workroom saving heat loss and extensive duct work to the outside. Roto-Clone is available in a wide range of capacities and types. Send for Bulletin No. 272.

American Air Filter Co., Inc.

Incorporated
312 Central Ave.
Louisville 8, Ky.

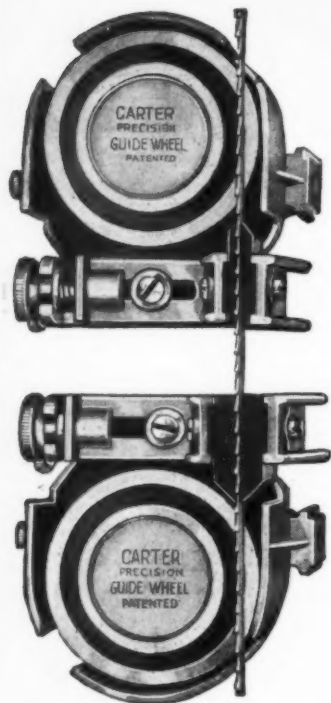
In Canada: Darling Bros., Ltd.
Montreal, P. Q.

*Registered Trade-Mark for a Dynamic
Precipitator or Hydrostatic Baffle-Type
Wet Collector.



TYPE D

ROTO-CLONE



MODERNIZE *your* BAND SAWS *with* **CARTER** MICRO GUIDE PRECISION GUIDE WHEELS *which*

enable you to safely speed your bandsaw wheels to 1800 rpm without fear of blade breakage or freezing and burning of bearing surfaces. Carter Guide Wheels will attain the amazing speed of 27,300 rpm. Increased speed and improved quality of work are definitely insured by installing Carter Guide Wheels.

Carter Products are nationally recognized as precision equipment for the modernization of lumber and wood-working equipment.

WRITE TODAY FOR PARTICULARS

CARTER

PRODUCTS COMPANY

960 Michigan Trust Bldg., Grand Rapids 2, Mich.

TODAY'S CHALLENGE:

To obtain maximum production economically in order to meet increased labor and material costs. Modernization of existing equipment is basic to the solution of this challenge.

Band Saw WHEELS • TIRES • GUIDES • GUIDE LIGHTS

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

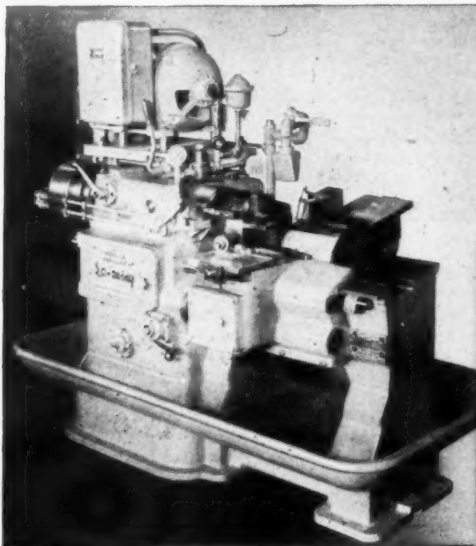
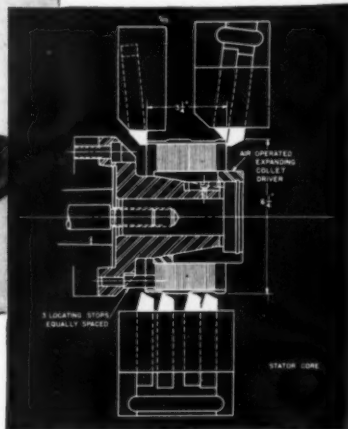


Illustration at left shows a Model "LR" Lo-Swing Lathe equipped for chuck work. This same lathe, tooled as shown in the line drawing below, is used for turning and facing Stator Cores described in this advertisement.

MODEL "LR" AUTOMATIC Lo-swing LATHE SAVES TIME ON CHUCK WORK

PROBLEM: To automatically turn, face and chamfer Stator Cores for electric motors. Operation must be fast and accurate.

SOLUTION: The Model "LR" Automatic Lo-swing Lathe selected for this job was equipped with a special air-operated, expanding collet chuck which assures close concentricity between the bore and the outside diameter of the Stator Core. The piece is positioned on the expanding collet by means of three equally spaced locating stops, shown



on the line drawing. The collet is expanded by means of a pull bar operated by an air cylinder mounted on the spindle. The outside diameters are turned with four tools mounted on the front slide and the squaring and chamfering is accomplished with three tools mounted on the rear slide.

The Model "LR" Lo-swing Lathe is completely automatic and may be operated by unskilled operators, who merely load and unload the parts and push the starting lever. Seneca Falls Machine Co., Seneca Falls, N. Y.

LATHE NEWS from SENECA FALLS

THE *Springfield* PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

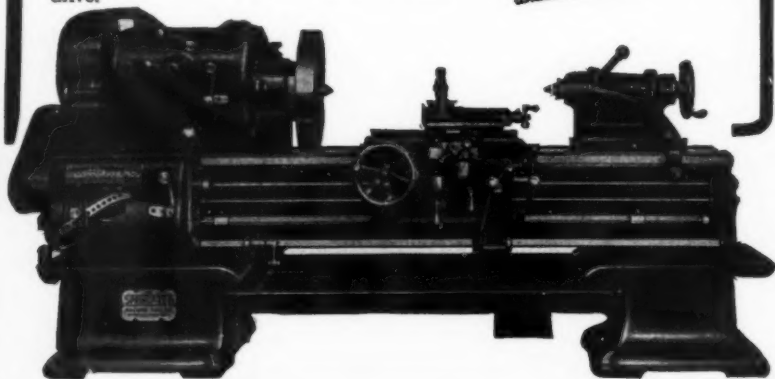
Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and ways are oiled from one well.

Regular equipment includes large and small face plates, tool posts, steady rests and all necessary wrenches. Motors are located in large cabinet leg under head stock connected to machine by either V belts or silent chain drive.

**BUILT TO GIVE
MAXIMUM VALUE**

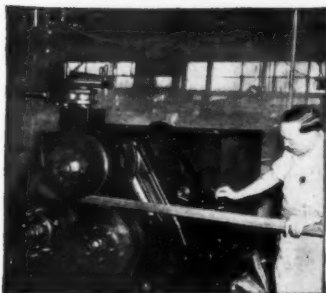
**SEND TODAY
FOR BULLETIN
No. 161**

**Tells the why and
how of Spring-
field's accurate
production.**



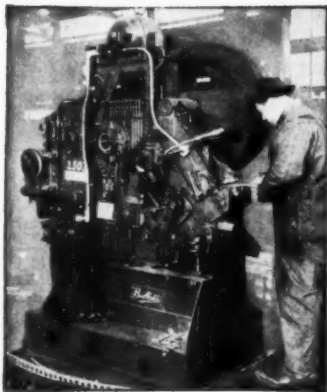
THE SPRINGFIELD MACHINE TOOL CO.
SPRINGFIELD • OHIO, U. S. A.

FROM *Lawn Mowers* TO *Tractors*



Literally, Buffalo Bending Rolls are used by the manufacturers of almost every type of rolling stock, large and small. Wherever there's a job which calls for curved metal — there's a place for Buffalo Bending Rolls to do the job better — and cheaper. If you are not familiar with the economies to be had with Buffalo Bending Rolls, write us, telling what you want to bend.

FROM *Brake-Bands* TO *Bridges*



Where metal is cut or punched, piecemeal or in production work, there is a "Buffalo" machine to do the job. Universal Iron Workers, used in thousands of shops, are combination punches, shears and bar cutters for general work. Buffalo Billet Shears are used for cutting forging stock. Other Buffalo machines include Rapid Acting Punches, Single and Double End Shears, Riveters and Sprue Cutters. Buffalo engineers will be glad to recommend a machine to fit your particular requirements. Write us.

BUFFALO FORGE COMPANY

161 Mortimer Street

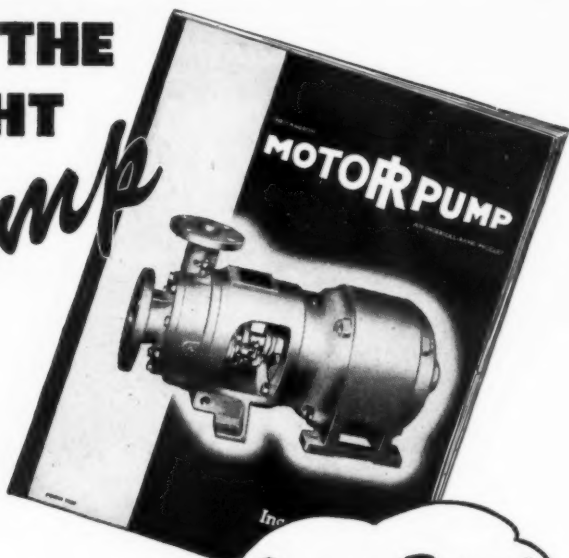
Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

**Machines for
Metal Working**

PICK THE RIGHT *Pump*



Yours on Request
ask for bulletin
number 7093.

Ingersoll-Rand has long been a leader in the small pump field. The complete line of Motor pumps ranges from 1 to 40 horsepower handling 10 to 1800 gallons per minute at heads up to 600 feet.

A pump is available to suit any condition. You can select just the right one from the performance charts in our bulletin No. 7093.

The Ingersoll-Rand distributor in your area will be glad to give you a copy of this bulletin or you can obtain one by writing our nearest branch as listed below.

Ingersoll-Rand

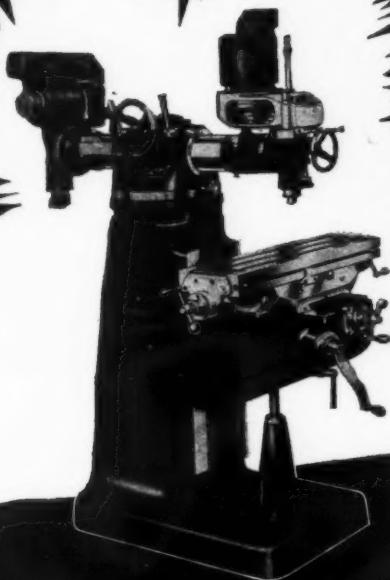
9-741

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11 Broadway, New York 4, N. Y.

the practical

TO YOUR MILLING PROBLEMS



THE BRIDGEPORT MILLING MACHINE

powerful—a precision machine for production demands.

Shaping operations can be performed at all angles, making this attachment fast and practical on die and mold work of all kinds, as well as for intricate slotting on production jobs.

Features include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

The Bridgeport Turret Milling Machine with High Speed Attachment handles milling, drilling and boring at all angles, with maximum ease and convenience. It is accurate and speedy, sturdy and

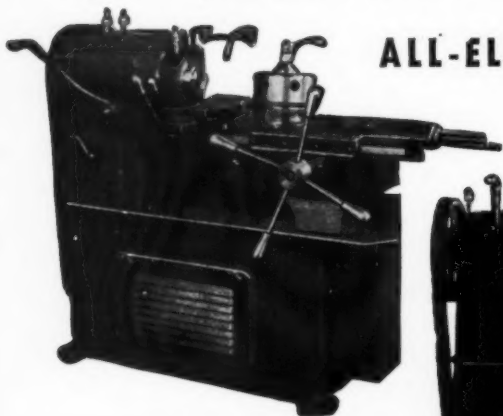
Bridgeport

WRITE FOR BULLETIN

MACHINES INC. BRIDGEPORT, CONN.

"BASIC UNIT+PARTS" PLAN

Gives you a Specialized Production Lathe at Lowest Cost



ALL-ELECTRIC DRIVE

with rapid speed changing and variable speed drive of 0 to 1500 RPM in either direction.



UTMOST FLEXIBILITY

Above is illustrated the "MINNEAPOLIS" Production Lathe equipped with all-electric variable speed drive. Speed range from 0 to 1500 RPM in either direction provides exactly the speeds needed for any series of machining operations. Any speed desired is instantly obtained with a crank while lathe is running. A dynamic brake operates automatically for quick stopping and reversing.

BASIC LATHE UNIT

with any one of 4 drives: single speed, low speed chain drive, four speed, or all-electric variable speed as shown above. You can then add only the equipment needed for your particular production "set-up".

SMALLER INVESTMENT - Lower Production Cost

The "MINNEAPOLIS" Production Lathe is extremely adaptable to any production set-up, particularly second operation work. Its simplified design and ease of control enable inexperienced operators to turn out high speed volume production.

The "MINNEAPOLIS" has 2 1/4" collet capacity, 14" swing, heavy duty spindle assembly. It is backed by more than 50 years designing and manufacturing experience. Send for literature — write us your production problems. Send sample part or drawing if possible — let us quote you on a "tailor-made" lathe for your work.

CENTRAL MACHINE WORKS CO.

Machinery designers and manufacturers since 1890

1241 Central Avenue

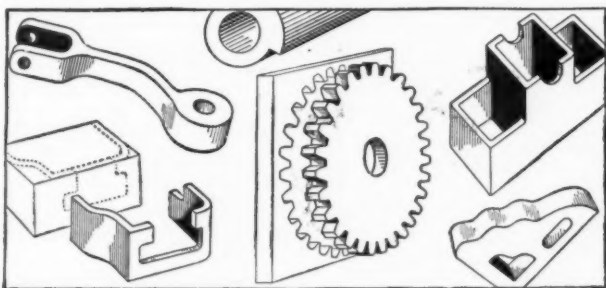
Minneapolis 13, Minnesota



'LENOX' *Diemaster*

Metal Cutting Band Saw Blades

Samples of "Lenox" *DIEMASTER* Precision Edge Sawing



They are particularly designed for fast precision work on all contour sawing, die-cutting and similar operations and are adaptable for Do-All and all other die and band saw machines.

Perfection in Hardness Depth —

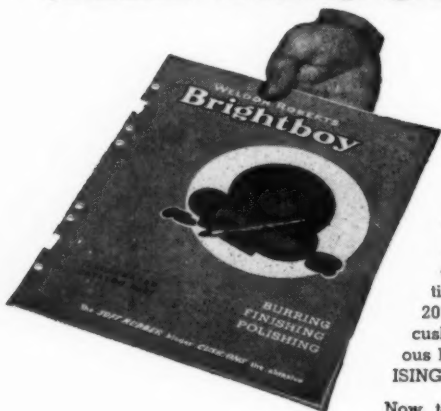


Maintained with absolute uniformity, just to base of teeth, by "Lenox" *Diemaster* method of temper control.

Buy Through Your Mill Supply Distributor

AMERICAN SAW & MFG. CO., SPRINGFIELD, MASS.

Have a Look at 'THE RECORD'



IN this new Brightboy Catalog are records of machine speeds, time and work savings up to 20% and more, through rubber-cushioned Brightboy's simultaneous BURNING, FINISHING and POLISHING.

Now, to help you offset mounting production costs, you should have this invaluable Brightboy catalog, together with Brightboy methods and applications data.

Your dealer will supply you. And Brightboy service men are ready to aid you with production-solution and product-improving recommendations. Write us.

3 Brightboy Textures: STANDARD, FINE-TEX, TUFF-TEX

**BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
NEWARK 7, N. J.**





NOPAK Manifold Valves are made in 3- and 4-way styles for single and double acting cylinders.



NOPAK Manifold Valves Promote Efficient Operation . . .

Where a number of air cylinders are to be controlled from a single station, NOPAK Manifold Valves permit highly efficient and compact assembly without complicated, unsightly piping. The operator's efficiency is increased, because all valves are mounted within easy reach on a single manifold, with levers aligned in vertical position.

NOPAK Manifold Valves embody the famous NOPAK Cored Disc design, packless construction, easy, positive control, and leak-proof, wearproof qualities. Bases are milled flat to provide a flush surface for gaskets if valves are bolted to a manifold plate. Individual pipe nipples may also be screwed into the valve body if the cored holes in the base are tapped out.

GALLAND-HENNING MFG. CO., 2754 S. 31st St., Milwaukee 7, Wis.

NOPAK

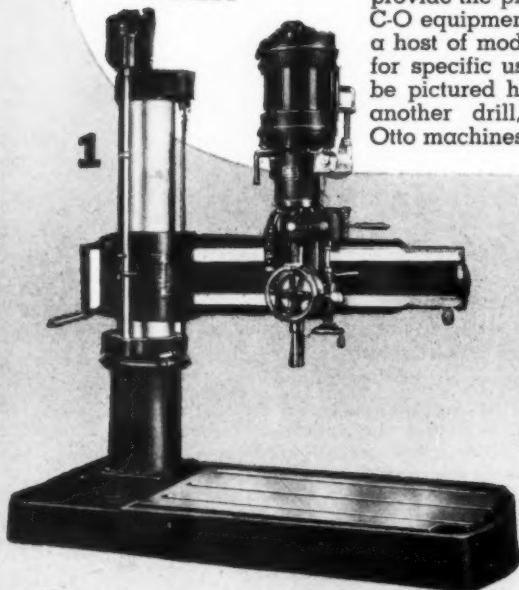
VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

CANEDY-OTTO DRILL PRESSES . . .

**USED
THE
WORLD
OVER**

In metalworking plants both here and abroad . . . you'll find Canedy-Otto Drill Presses performing profit-producing results for their owners. Sound engineering and construction combined with unique C-O features provide the plus factor which makes C-O equipment preferred. There are a host of models . . . each designed for specific uses. Only a few could be pictured here. Before you install another drill, investigate Canedy-Otto machines.

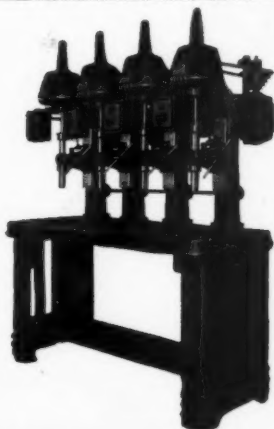
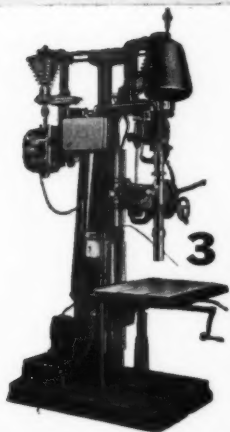


Manufacturers of Drilling Equipment Since 1892



CANEDY-OTTO
General Offices and Factory:

- 1** An 8-speed Motor Spindle Radial Drill of 13/4" capacity. Simple in design . . . yet with sufficient controls to assure accuracy and quality performance. New features also help to maintain popularity of this drill.
- 2** A general purpose production drill . . . identified as a 21" Sliding Head Motor Driven Floor Drill . . . and available with either a square oil grooved or round T-slotted type table.
- 3** Showing a 21" Sliding Head Box Type Column Floor Drill . . . produced in single and multiple (2 to 6) spindle models. Built for accurate work . . . and for years of service.
- 4** Four Spindle Bench Drill with legs . . . which are also available with single, two, three, five and six spindles. These models eliminate unnecessary benches. Shelves are provided for use as tool trays.
- 5** Single Spindle Floor Drill which is also available in multiple spindles from 2 to 6 . . . and in bench models. Equipment is well designed and built for quality production.



Send for full details of the equipment which will best serve your purpose. Let us know your problem . . . A C-O analysis will be helpful to you. Write today.

MANUFACTURING CO.
CHICAGO HEIGHTS, ILLINOIS

New **ROGERS** "*Perfect 36*"

VERTICAL TURRET MILLS

Only **\$6850⁰⁰**

COMPLETE F. O. B. ALFRED, N. Y.

SO

**WHY PAY MORE FOR
A *Used* MACHINE?**

Also with new Rogers Mills you will not inherit somebody else's headaches. You are further assured of accurately finished work and trouble-free performance by the Rogers factory guarantee of complete operating satisfaction.

Rogers "*Perfect 36*" Vertical Turret Mills pay for themselves on production lines and maintenance departments with,—

**LOW PRODUCTION COSTS
LOW OPERATING COSTS
LOW INITIAL COST**
plus

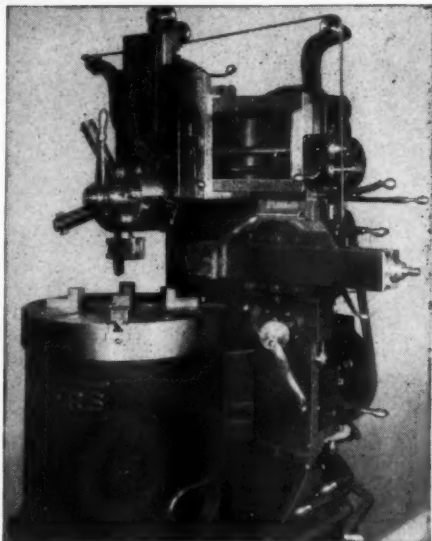
Over 60 years of developments and engineering achievements.

Write for CATALOG Today

**ROGERS
MACHINE WORKS, INC.**

**SALES OFFICE: 1813 ELMWOOD AVE.
BUFFALO 7, N. Y.**

FACTORY: ALFRED, N. Y.

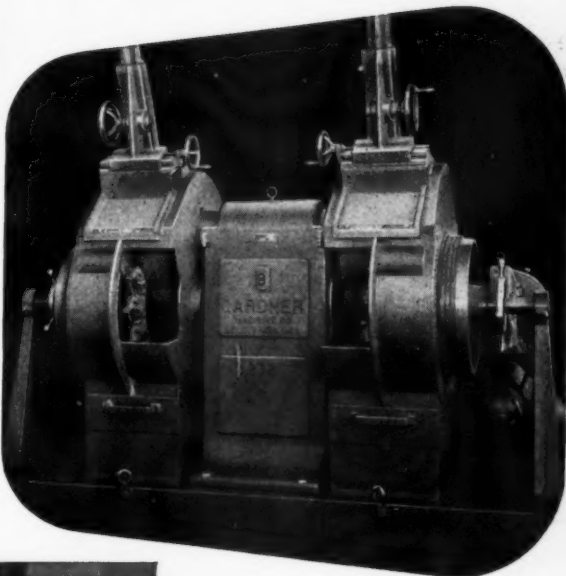


Knowing How Since 1885

HIGH

PRODUCTION On Small Flat Surface Parts

Machine design ingenuity is overcoming many of today's high production and accuracy problems. New and better ways of performing grinding operations, for example, are being developed every day. A case in point is the angle-grinding of steel expansion brushes.



Both ends are ground to 45° angles on this No. 218-18" GARDNER GRINDER that is equipped on both ends with rotary work carriers. The brushes are held at 45° angles in stations on the carriers and are automatically clamped and unclamped. Adaptors permit accommodating several sizes of brushes.

PRODUCTION: 15 to 20 surfaces per minute, per operator, per end of machine.

TOLERANCES: .005" for uniformity.

Give a Thought
to
GARDNER GRINDING
in Your
Modernization Plans!

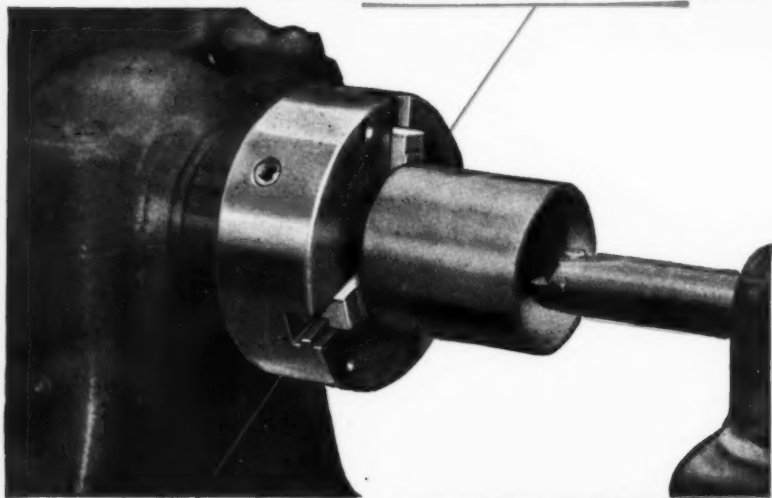
Write for GARDNER Double-Grinding Bulletins!

GARDNER - GRIND
YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

436 East Gardner Street • • • Beloit, Wisconsin, U.S.A.

New Low Cost *Precision* Chuck!



For INTERNAL and EXTERNAL Work

IDEAL "UNIVERSAL"-5" CHUCK

3-jaw self-centering type chuck. Two sets of jaws (ground to close tolerances) furnished with each chuck, for internal and external work. Precision made for accuracy and fast chucking. Available with $1\frac{1}{2}$ "-8 threaded body, or with mounting adapter.

Also IDEAL 4-jaw "Independent"-6" Chuck. Easily adjustable jaws are made of hardened and ground steel—jaws reversible for external or internal work.

Other IDEAL Machine Tool Products include: Dust Collectors, Demagnetizers, Metal Etchers, Grinding Wheel Dressers, Balancing Ways, Granite Surface Plate.

2058

Machinery Products Division

IDEAL INDUSTRIES, Inc.

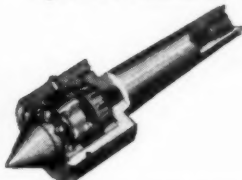
(Successors to Ideal Commercial Drucker Co.)

1437 PARK AVE.

EVANSTON, ILL.

OVER 100 PRODUCTS TO HELP MACHINERY SERVE BETTER

IDEAL Live Centers Speed Production



Handle heavier loads—permit deeper cuts at higher speeds because they rotate with the work. The special bearing construction assures accurate turning for precision jobs. Four inserts are easily and quickly interchangeable for centered or uncentered work. Accepted as standard in all leading tool and machine shops.

**FREE—Write for IDEAL
Machine Tool Catalog**

Sales Offices in Principal Cities • Consult Your Local Telephone Book • In Canada: Irving Smith, Ltd., Montreal

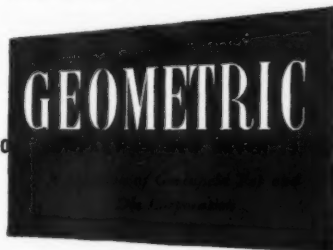


NOW you can buy this ...

**Precision Machine
for
Production Threading**

Do you thread parts on a production basis? Then you'll be glad to know that this No. 16 Geometric PRECISION Threading Machine is again available. It is easy to set up and operate. It is sturdy, fast and accurate. It cuts threads up to 1" diameter (N. C.) and 1½" (N. F.). The No. 16 Geometric PRECISION Threading Machine has lead screw and vise type chuck as standard equipment. Lead screw can be disengaged for

manual feed if desired. Chuck is removable so other work holding devices can be used. This machine is tops for quantity production of duplicate threaded parts. Write for details today.



FOR NEARLY EVERY THREADING JOB — A GEOMETRIC



Since 1903

Strand Flexible Shaft Machines have answered the call for portable, rotary power with efficiently designed, solidly constructed flexible shaft machines that insure constant speeds with dependability and greater operator convenience.

If your job calls for grinding, polishing, buffing, sanding, drilling, reaming, screw-driving or nut-setting—especially in out-of-the-way places, a Strand machine will do it faster, better, and stand up to it longer. Hundreds of attachments can be easily interchanged. 125 types and sizes. Models include vertical and horizontal type machines from $\frac{1}{8}$ to 3 H.P. Distributors in all principal cities.

Send today for 112 page catalog showing complete line.



Type M5



N. A. STRAND & CO.

5016 NO. WOLCOTT AVE. CHICAGO 40, ILL.

Here's ACCURATE, FAST CENTERING



.....OF LONG AND SHORT SHAFTS IN BOTH LONG AND SHORT RUNS

● Here's productive help for you on centering operations. Sundstrand centering machines, made with the same precision and rigidity as Sundstrand Rigidmils, will prove profitable investments.

HANDLES SHAFTS FROM 1/2" TO 6" DIAMETER UP TO 96" LONG

If your work calls for accurate centering of one or both ends prior to other machining—if it is within 1/2" to 6" in diameter and up to 96" in

length — it can be handled to advantage on Sundstrand centering and drilling machines.

In work requiring only centering of simple parts these machines offer ease and speed of handling, reduced production costs, and compact, space-saving construction.

If not too complicated, special applications such as combined operations or machining of odd-shaped parts can also be handled by means of attachments and fixtures.

2 STANDARD MACHINES AVAILABLE

— Complete data covering the No. 53 and No. 56 centering machines are available in these two bulletins. Write today for your copies — ask for bulletins 53-5 and 56-5.



SUNDSTRAND MACHINE TOOL COMPANY

2535 Eleventh St. • Rockford, Ill., U. S. A.

Featured In This Issue

TURRET LATHES Part III, presents some additional facts about operating equipment. Mr. Hyler includes illustrations of several typical lathes calling attention to unusual and interesting design features. See page.....127

INDUCED HEAT Rolls Up Its Sleeves is by R. M. Serota and is published thru courtesy of the Allis-Chalmers Co. Mr. Serota tells about some of the latest developments in this important field. Typical jobs are described and the data may suggest other applications. See page.....145

HIGH PRECISION CASTINGS are being made in volume by the Haynes Stellite folks these days. The process is known as "Lost Wax" or Investment Casting. Castings are reproduced with remarkable fidelity, using alloys that would be very difficult to machine. See page165

BALL VERSATILITY by H. F. Williams is a resume of a series of articles on this subject which have appeared recently. Mr. Williams describes some additional applications. It is possible some of these can be used in new applications. See page181

LOOKING AHEAD is a brief review of some of the things that are worrying manufacturers these days. See page192

CONTOUR FORMING is the name given to the reforming of metal sections from straight lines or prior curves into a variety of other shapes. The data and illustrations were supplied by Cyril Bath and a number of typical forming jobs are illustrated and described in the story starting on page199

WELDING of many specialized types helped to produce the General Electric Shooting Star engine. Some interesting angles will be found in the story starting on page219

FLAME PLANERS help to speed the cutting and edge preparation of steel plate during the war. Francis A. Westbrook tells about it in the story beginning on page227

RACK DESIGNS for spindle lathes by H. F. Williams covers several designs of equipment for providing spindle movement. See page236

BUDGETING Post War Operations, by Arthur Roberts reveals the usefulness of a budget in charting business operations. See page241

"LET'S TALK SHOP" is the regular section of shop items. Here you will find discussion of compensating elements and devices by John E. Hyler; eye safety; an unusual plant loading chart; some observations on climb milling; and other helpful bits. See page248

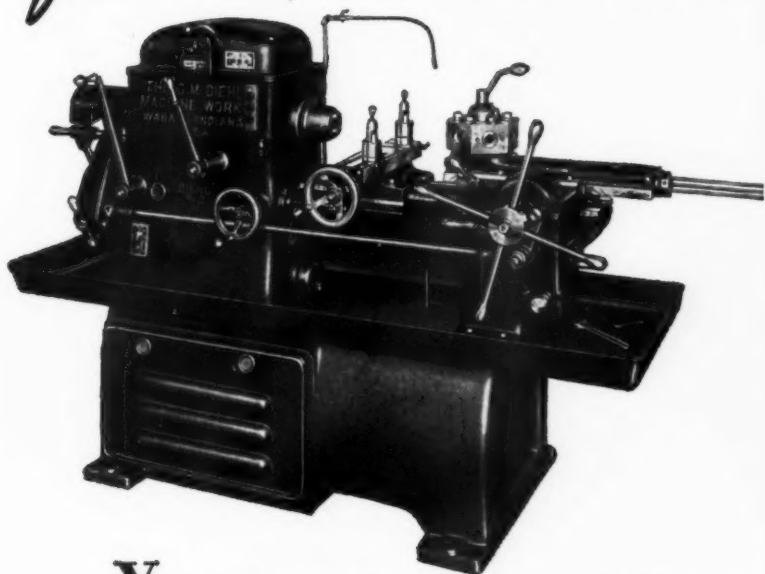
SCREW THREAD STANDARDS tells what is being done in the adoption of universal standards. See page268

WHAT'S NEW offers the regular monthly parade of new tools and equipment. See page284

MECHANICS THRU THE AGES, page392

PRODUCTS INDEX, page394

Use **DIEHL** TURRET LATHES *for those Production Jobs*



YOU can't beat Diehl for smooth accurate cutting to rigid specifications . . . just the lathe for those "production" jobs. In addition to its high speed precision performance, it works right alongside other No. 2 lathes of standard make —using same tooling, including collets. Write today for complete specification folder and details.

Automatic chuck capacity
(round)1"
Swing-over cross Slide.....6"

Swing-over Bed14"
6 speeds.....forward and reverse
6 feeds.....to turret slide

The G. M. DIEHL MACHINE WORKS, INC
WABASH, INDIANA, U. S. A.

As The Editor Sees It

THE danger of inflation and higher prices can be avoided by cutting costs of production thru utilization of more efficient production equipment such as machine tools. That was what William P. Kirk, President of the National Machine Tool Builders' Association told members at their recent spring meeting. Continuing he said:

"The time is not far distant when many of our customers, instead of going down to Washington to plead with OPA, will be back home in their plants trying to see how they can get their costs down to a point that will enable them to meet competitive prices in their own industries.

"How is a manufacturer going to cut his costs today?

"He cannot cut his costs by lower wages.

"He cannot expect to cut his costs by lower prices on materials.

"He has little hope of cutting his costs because of lowered taxes.

"The only avenue remaining open to him is that of cutting costs by increased productivity due to the utilization of new and better machine tools.

"The question is—are we going to be equal to this tremendous sales opportunity?

"First of all, we must do a real job of redesign and improvement. We must present to our market, machine tools that will do more work, faster and cheaper than it was ever done before.

"The second point, and I think this is of still greater importance today—is that we must learn to sell our product on a basis of economics, instead of on a basis of functional performance.

"What counts is the machine's ability to multiply the output of the individual worker. We must learn to stop talking about mechanisms and concentrate on results in terms of output

per day, per man. Our whole story must be one of increased productivity which in turn permits manufacturers to reach better markets at lower prices, increase the volume of business, and employ more men.

"Only by employing this sales psychology will we be successful in overcoming what I term the secondary resistance to machine tool sales. By this I mean the resistance of some leaders of organized labor to the full utilization of machines capable of increased productivity.

"In past years the owners of a manufacturing enterprise were the only people we had to sell. We didn't have to worry about the employees. But today we have to sell the employees, as well as the owners, if our new and better machine tools are to be bought and utilized to their fullest possible extent.

"You and I know, that in many cases and in many plants it has been impossible for the manufacturers to get out of our new machine tools, the full measure of productivity that has been built into them. Why?

"Because somebody says—Hold down the number of pieces produced per hour. Slow down the machine. Don't let that machine produce what it really can produce.

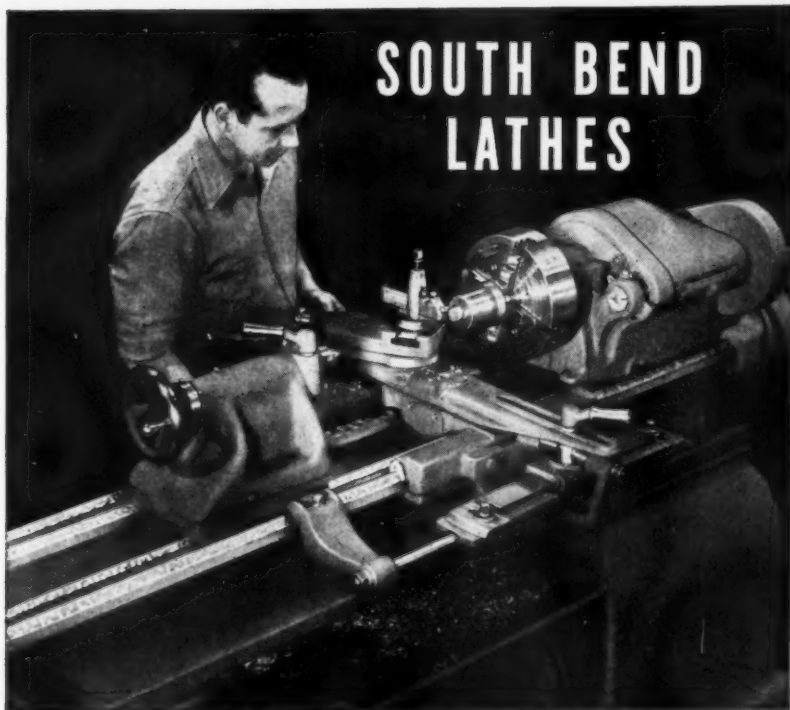
"What is the reasoning behind this strange philosophy?

"The fact is, workers have been sold by the unions, and by various left-wing crack-pot economists, on the idea that better machines destroy jobs.

"We know that is a fallacy. We know that increasing productivity with better machines, in the long run increases jobs instead of destroying them.

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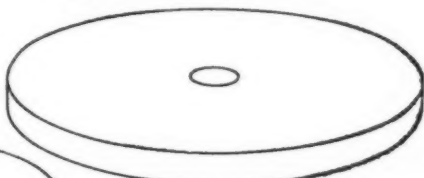
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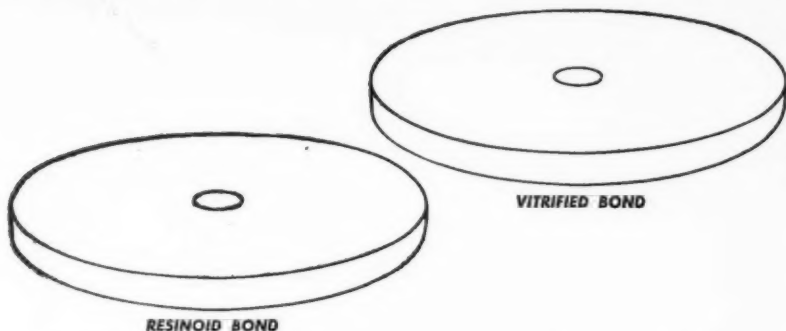


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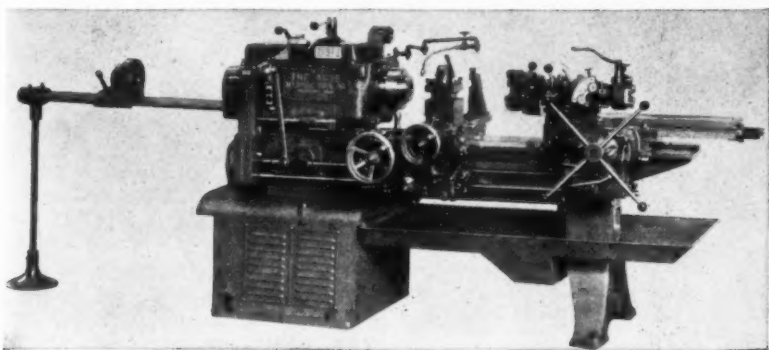


PART III. — CHUCKS AND ALLIED EQUIPMENT

By JOHN E. HYLER

HOLDING devices as used for bar stock have been considered in the preceding article. Methods employed for holding chucked work vary much more. Hydraulic and pneumatic chucking devices are used to a great extent, tho they are by no means universally adaptable. Shops installing turret lathes should give careful consideration to their entire range of turret lathe work,

and especially to that proportion of the work which might be considered producible either from bar stock, or from forgings or castings. It is a fact that some plants are producing work from bar stock that could be made advantageously from forgings or from castings. In some instances, the reverse is also true. In general, a decision as to whether parts will be turned from bar

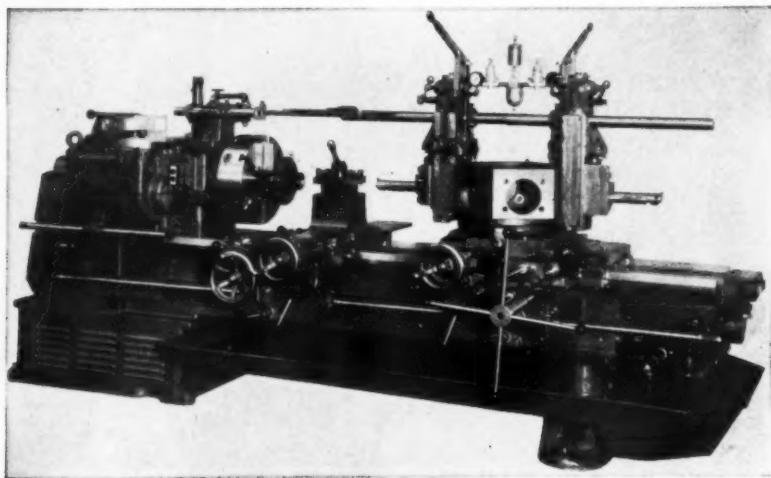


You will observe a lead screw for the carriage on front of this Acme-Cincinnati turret lathe, which is fitted with a thread chasing attachment, and is shown tooled with a new type of high speed roller rest turners. The machine is of ram type, and the turret saddle can be bolted in any position along the hardened ways. It has a bar stock capacity of 2" on round stock.

stock, or produced from forgings or castings, should be based on machining time involved, over against cost of the material. While the cost of forgings is greater than that of bar stock, less material has to be removed from forgings, because they are made to approximately the required shape. There naturally comes a point, then, where the savings in machine and operator time will fully offset the added cost of material. Other things being equal, parts made in small-sized lots often will be made from bar stock, while large lot sizes can be made more profitably from forgings.

machining. It is evident that where pieces of given diameter are to be machined from bar stock, turret lathes having spindle bores sufficiently large to pass the stock thru must be employed, while much smaller machines can be used for turning chucked forgings or castings, of the same finish diameter.

Arbors of expanding type are often used for holding work with small internal bores. Internally threaded work, which is to be turned on the outside, is secured on special threaded arbors designed for the purpose, an endwise

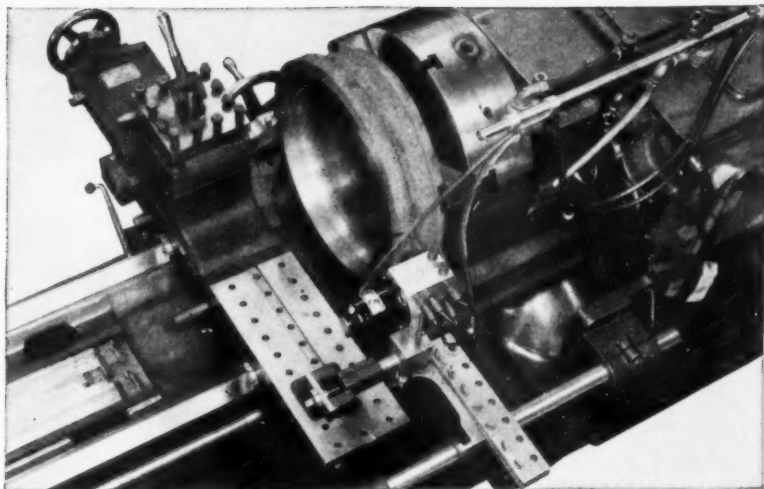


An interesting turret lathe operation, in which the Acme-Cincinnati turret lathe used has a cross sliding, hollow hexagon turret, capable of being used for contour boring of molds. The lathe is equipped with an overhead air operated profiling attachment with master cam holding bar in swivel. Profiling attachment can be seen above the hexagon turret.

There is a direct bearing on the size of turret lathe that will be needed, based on size of the pieces and selection of material for turnings. Smaller machines always can be employed in cases where forgings or castings are used, which are chucked for

motion of the arbor being provided, by one means or another, to clamp the work tightly against the face of the arbor. Thus, it cannot turn further on the threading, while the material is in the cut.

It is chucked work, however, which



View of Cincinnati Acme, fixed center hollow hexagon turret lathe from the back, showing a Detroit Hydro Electric Duplicator attachment to the universal slide carriage, and in use for facing the contour shown in the work. Photos, courtesy Acme Machine Tool Co., Cincinnati)

presents the greatest array of work-holding problems, because there is so much variation in this work as a general class, not to be found in either bar-type work, or in smaller work that is internally bored. The various problems encountered have led to the development of many standard and special chucks and chucking devices. Where workpieces are always regular and round, the so-called universal chucks are generally preferred among hand-operated chucks. These are made in different designs, but have the advantage that all of the chuck jaws incorporated, move together. In cases where the chucking surface of the part is not exactly concentric with the portion to be machined, and where the quantity to be machined is small, independent chucks are employed, allowing each of the chuck jaws to be independently adjusted, as the need may appear, for lining up the work properly. So-called

combination chucks are also used by some, which allow each jaw to be moved independently when desired, but which also have provision for moving all of the jaws at once. Different chuck builders will supply any of these chucks that may be desired.

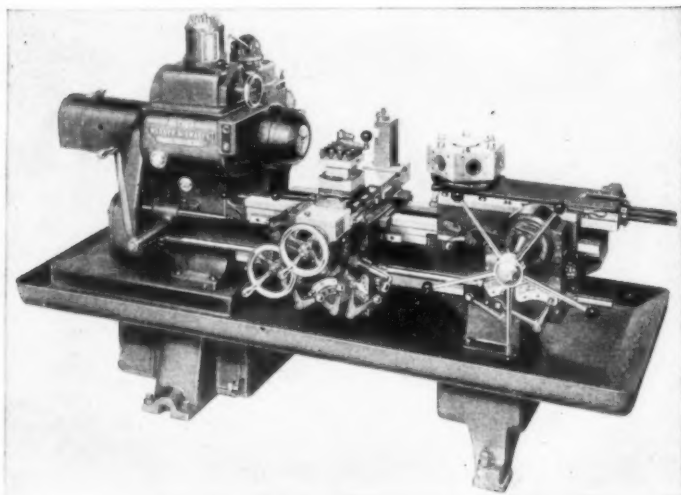
It is interesting to observe, in this connection, that different companies have developed chucks of wrenchless type, in which the simple pull of a lever locks the workpiece into the chuck. This naturally speeds the chucking process considerably. Chucks of this kind are adaptable for a diversified line of work, ranging from small brass castings to heavy forgings. The hand lever used for closing the chuck, and opening it, does not revolve. It operates a cam thru differential gearing, and the arrangement is such that the jaws may be opened or closed while the chuck is revolving. Also, the gripping pressure of the jaws

may be made stronger, or lessened, while the machine spindle is revolving. The center of the wrenchless chuck is open, so that bar stock can be handled, if and when desired. Such chucks are very convenient in many cases, tho they are not recommended for very high spindle speeds.

Hand chucking operations on large work have always been very tiring, and there is little doubt that on many turret lathe jobs, operators have accomplished considerably less work as a result of excess effort expended in this direction. It is very interesting to note that one of the leading builders of turret lathes has developed an electric collet chuck booster, in which tightening of the collet on large bar work is performed by a motor, operating thru a worm drive and a multiple-disc clutch. Using this booster, a woman can tighten a collet on

large bars, where formerly all the strength of a man was required for the purpose. Incidentally, the booster layout incorporates a safety link arrangement, so that damage cannot be done to the mechanism thru over-tightening. The device can be installed quickly. It is not usable, however, on machines having lead screw threading gear boxes.

Another device which saves the operator much effort on heavy chucking usually performed with a hand wrench, is known as a power chuck wrench. This device may be applied to any standard machine, and its operation is very simple. There is a handle which is pulled by the operator. Pulling this handle engages the wrench with the chuck, and turning it applies power to the wrench. This type of power wrench can be used on bar work, as well as on



Here is a universal Warner & Swasey turret lathe of the ram type, having a collet chuck capacity for 24" round bar stock. The geared headstock of this machine provides 12 speeds. Atop the geared headstock can be seen the "Preselector" mentioned in this series, by means of which the next spindle speed desired can be selected in advance, and then the speed change can be made by the single shift lever shown.



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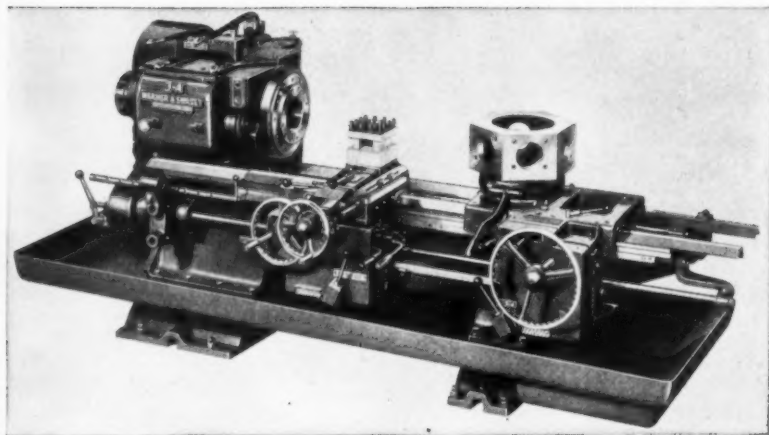


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A highly competent heavy-duty Warner & Swasey turret lathe of saddle type is shown in this illustration. It can be obtained with a spindle capacity for round bar stock either 4½" or 6" in diameter. Still larger machines are available which will handle round bar stock as large as 12" diameter. 16 different tool feeds are provided for both the square and the hexagon turret.

actual chucking. The gripping pressure delivered is regulated by a transformer. Therefore, delicate work can be chucked and held without distortion, using this wrench, if necessary.

Revolving-jaw chucks save multiple handling on parts having several faces to be machined on the turret lathe. Valve bodies and similar work, in particular, are often machined while held in this type of chuck, and for that reason, they are often called valve chucks. Ball bearing valve chucks are available from some makers as standard equipment, in a wide range of sizes. In order that the jaws holding the workpiece may be revolved exactly the correct amount, they are fitted with index plates, usually arranged to index on 90° spacing. It is obvious, however, that the spacing on such index plates may be made whatever a given type of work may demand.

Chuck Jaws

The type of chuck jaws that will be used, in machining any given type of work on the turret lathe that is chuck-held, is a matter requiring careful consideration in many instances. Various kinds of top jaws, as they are termed, may be attached to the primary or master jaws, which are held in the main chuck body. Jaws used for gripping rough surfaces of castings or forgings are made hard, and serrations are ground into them, leaving fairly sharp edges or points, that have considerable "biting power", so they penetrate the rough work sufficiently to hold it from turning against the leverage of a heavy cut. Work which is chucked a second time in the turret lathe, using a previously-turned surface for engagement with the chuck jaws, must be held with soft jaws, that will not mar the work surface. Soft jaws, often spoken of as second-operation chuck jaws, must fit

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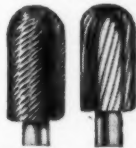
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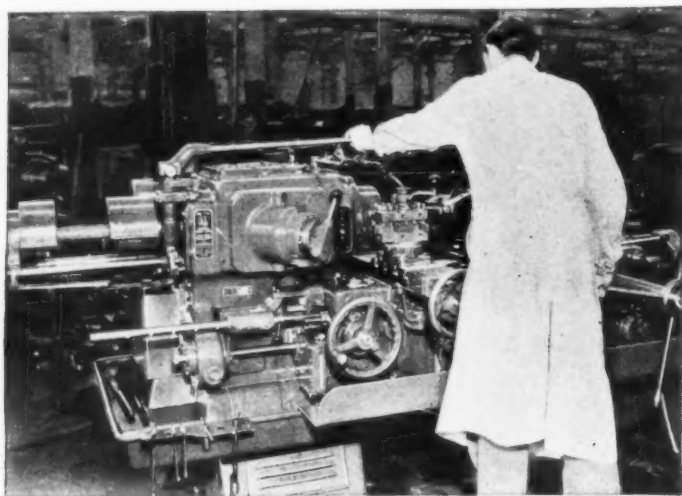
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the contour of the work perfectly in many instances, in order to obtain the maximum amount of gripping efficiency with a reasonable amount of pressure. In order to insure that they will fit the workpieces perfectly, the gripping portions of the jaws are bored (or turned, in the case of internal-gripping jaws) in place on the chuck. The jaws must be clamped on a disc, or in a ring, with approximately the same pressure with which they will engage the stock, while they are being trued.

be chucked to advantage. Where work is of irregular shape, it is very often the case that a faceplate is mounted on the turret lathe spindle, and a fixture, which has been designed and built to hold the work, is attached to this faceplate. Various kinds of indexing fixtures are developed for use in this connection, in different places, making it possible to index the holes in a hole circle, for instance, into line with the center of the machine spindle, one at a time. Enough metal can be included in the

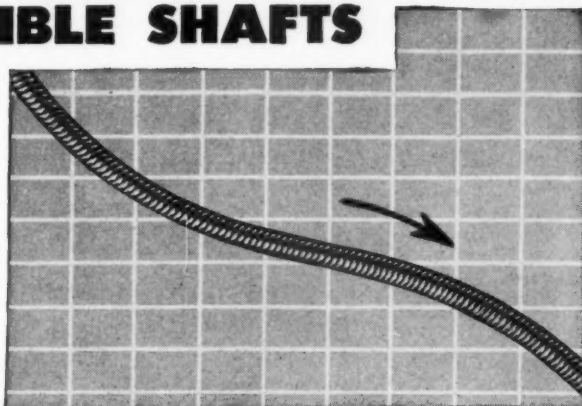


As the operator swings back the lever on this Jones & Lamson Universal Turret Lathe, the collet chuck is opened and the stock is fed forward

Space limitations will not allow of considering chuck jaws in particular, tho there are many variations for different types of work. Manufacturers of either turret lathes or chucks can give first class recommendations in any particular case, not only with regard to chucks and chuck jaws, but also concerning the making of various special fixtures, for holding work which cannot

fixture, at such locations as may be necessary, to provide proper balance for the mass, while it turns with the lathe spindle, regardless of the fact that the workpiece itself is revolving far off center. It is practically always possible to design and make fixtures allowing given types of jobs to be handled properly on turret lathes. Determination of methods for holding different kinds of

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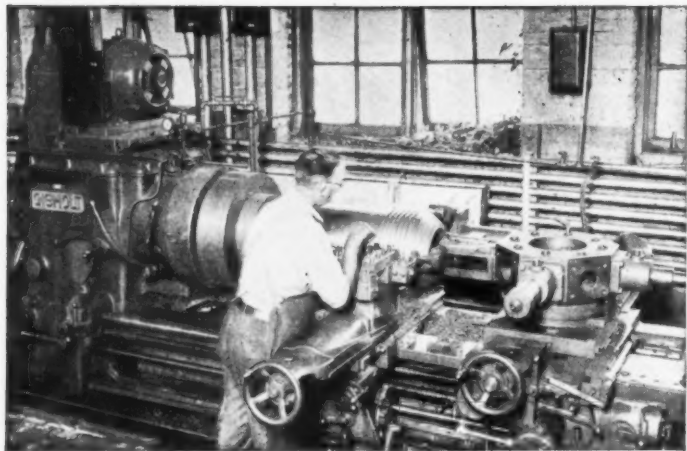
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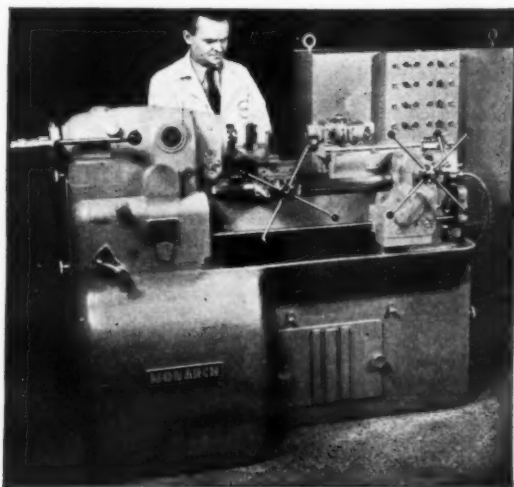
This Gisholt 4L Heavy Duty Turret Lathe machines 13 different sizes of Diesel engine pistons.

work properly, is one of the outstanding phases of advanced turret lathe practice.

One very interesting phase of lathe

practice, found in use on turret lathes in different places, is that of contour turning and boring. Where a turret lathe is properly fitted out for this kind

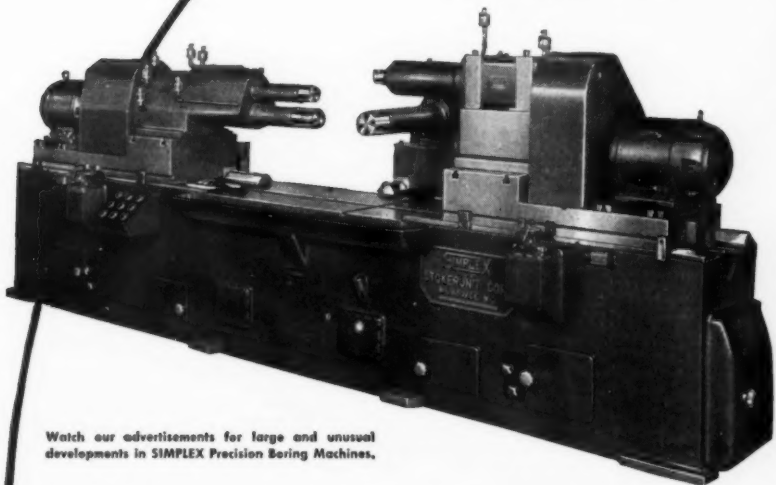
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of work, all that is needed to produce different contours in both bored and turned surfaces, are inexpensive templates. The process requires the use of a special duplicating device, which follows the template, and thereby governs the movement of the turning or boring tool, toward and from the center of rotation. The use of such a duplicator does not limit the machine to which it is applied, to duplication work, however. By means of a push button station, the duplicating equipment can be disengaged, when the machine is ready for standard turret lathe operations. Equipping and tooling a lathe for duplicating work is really a job for turret lathe engineers. There are some turret lathe builders that have specialized in this particular field of endeavor. The largest amount of such work is involved in the making of dies and molds requiring special contours, either internal or external. Molds for plastic, rubber, glass, etc., are made at very low cost by this process, especially when a given pattern or type of contoured mold or die is required in considerable quantity.

Contouring in moderation can be and sometimes is accomplished with taper attachments used on the turret lathe. Since various shops have definite need for taper attachments on one or more of their turret lathes, it is well to remember this. One popular turret lathe can be fitted with a taper attachment, which will turn tapers either toward or away from the spindle, as may be required, which will not interfere in any way with normal machine operation. It can be installed on turret lathes already in service, and standard taper plates used with it will produce tapers up to 1½" included taper per foot. Such tapers are at an angle of 3 degrees and 34 minutes with the center line of the work. The company providing this attachment can supply contour plates for use with it, as already indicated, and plates for turning steeper tapers can also be supplied, if desired.

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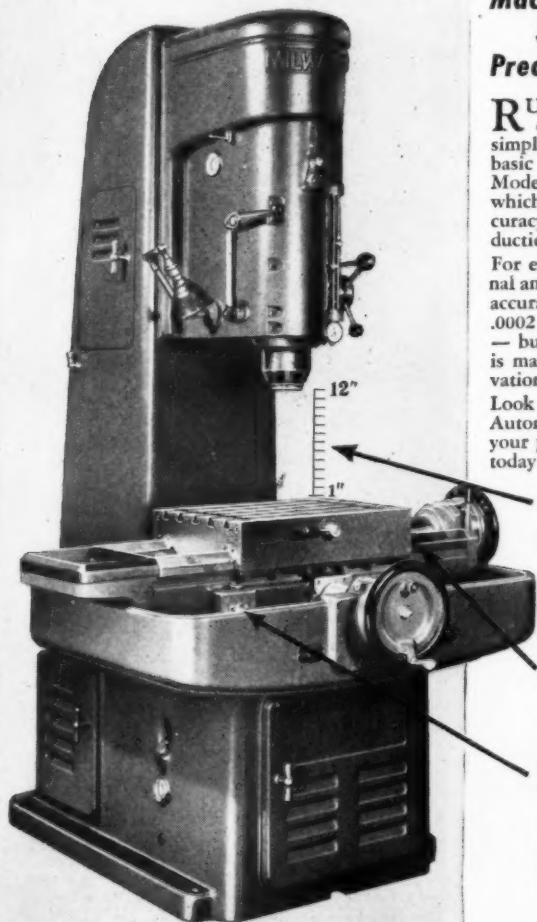
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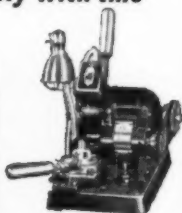
Saddle is also mounted on accurately ground ways and positioned by a precision screw thus maintaining transverse accuracy at all work elevations. All alignments affecting accuracy of the workpiece are held to within a non-accumulative error of .0002 inch in any 12 inches.

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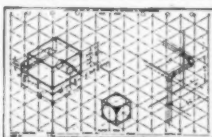
Another highly competent turret lathe can be supplied with an adjustable taper attachment for the cross slide carriage, which allows cutting of tapers up to 3" per foot for 12" lengths, where desired. Increased taper values can be obtained on shorter turning lengths. This attachment, capable of being used in any position within the range of the carriage, is firmly mounted, and does not interfere with rear cross slide tools. It can be applied to machines already in service, at any time.

Most of the older mechanics can readily remember the day when accurate and economical cutting of threads on the turret lathe was not a possibility, so far as small lot sizes were concerned. Now, however, there are many modern universal turret lathes which have high-class thread chasing equipment. Whereas, in taking work that had been machined on a turret lathe in the old days, to the engine lathe for threading, involved a possible loss of concentricity because of the need for chucking workpieces a second time, doing such threading in the turret lathe, where the rest of the machining is done, not only insures against this trouble, but saves a great deal of time, also. The modern turret lathe, then, as it stands equipped with proper thread chasing attachment and lead screw, is a most worthy subject for investigation by any manufacturer having work of this kind to perform.

(To Be Continued)

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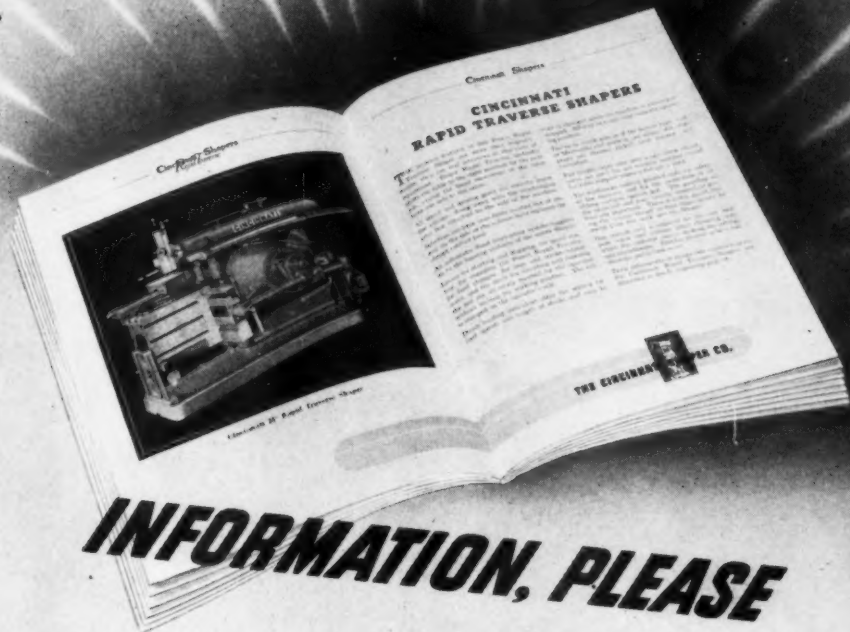
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Today, as ever, Cincinnati Shapers are indispensable in both the large plant and the small shop. Such Cincinnati features as built-in power rapid traverse to the table, multiple cam feeds, direct reading indicators bring to the user of a single machine or of many machines an outstanding usefulness.

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A fast operating, precision Machine Tool for saving time in grinding difficult contours, and irregular shapes and profiles. In production as well as in tool and die work, it performs quickly, much of the tedious work formerly requiring hours of hand time.

Spindle speed of 20,000 R.P.M. with vertical oscillation assures rapid stock removal, even with wheels of small diameter. Accommodates wheels $\frac{1}{8}$ " to 1" diameter.



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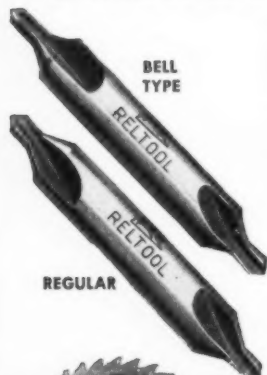
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INDUCED HEAT

Rolls Up Its Sleeves

By R. M. SEROTA*

HIGH-POWER vacuum-tube oscillators for frequencies above 100,000 cycles per second are constantly proving to metal-fabricating industries that induction heating is an extremely useful, efficient, and economic tool.

Manufacturers who evaluate the efficiency of new methods of processing on the basis of whether they will help produce a better product or perform a given operation more economically are finding that high frequency induction heating equipment holds the enviable position of satisfying both objectives.

Altho electricity is inherently an expensive commodity for heat generation, operation costs of this newest heating method are justified by the saving of

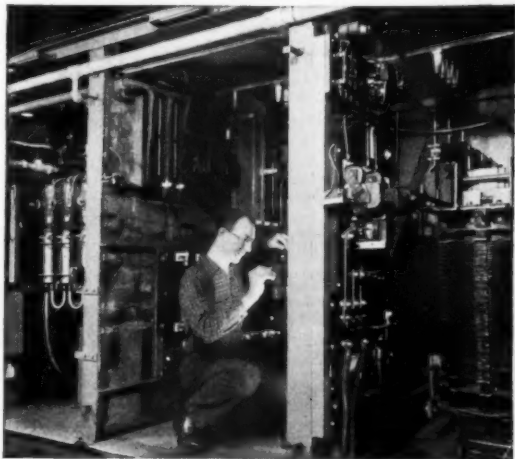
time thru selective hardening and rapid heating, uniformly good quality, reduction of rejects, and use of unskilled labor.

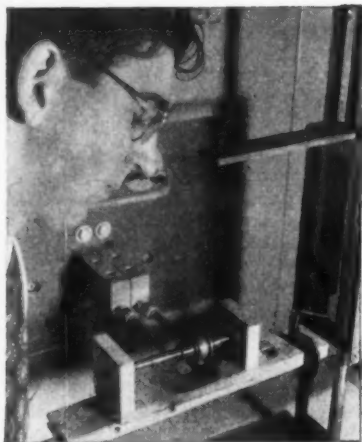
This is not to be construed as a prediction that induction heating will replace other means of heating, but that in several categories of applications, such as surface hardening, annealing, brazing, soldering, melting, and preheating for forging, it has unique advantages.

On the basis of both laboratory tests and actual production problems, these applications clearly indicate the savings possible with this type of heating equipment:

*Electronic Devices Section,
Allis-Chalmers Mfg. Co.

OF SPECIAL DESIGN for hardening shafts, this new 100 kw electronic heater is more powerful than most commercial broadcasting stations. Interior view of this unit, operating on a frequency of 400 kilocycles, shows, left—high frequency oscillator with four water-cooled vacuum tubes; middle—high voltage rectifier six-phase system supplying 12,000 volts d-c; and right—160 kva transformer with associated switching equipment.





EIGHT SECONDS are required to harden thrust bearing surfaces; bearing rotation confines heating and hardening to side surfaces without excessive heating of other surfaces.

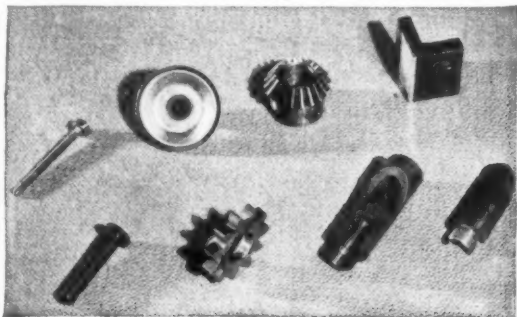
Surface hardening savings

In surface hardening of steels, for instance, we find these savings:

1—Only a surface layer is rapidly heated, which prevents scaling and distortion and greatly reduces amount of heat required.

2—Carburizing process is eliminated by using a hardenable steel.

HARDENED OBJECTS are a pinion gear (top, third from left) and a spur gear (bottom second from left). Brazed jobs are (top row) a contact stud, oiler cup base, silver contact insert on copper, (bottom row) contact stud, and bomb fuse assemblies.



3—Copper plating of areas not to be hardened is eliminated, since induction heating makes selective hardening possible.

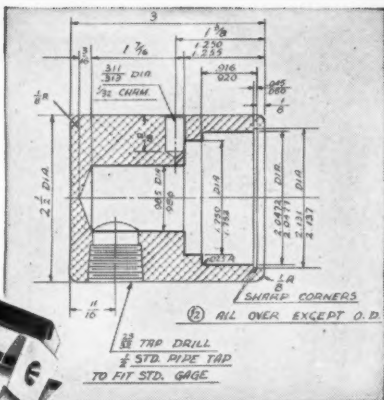
4—Time is saved by rapid heating and elimination of much work handling.

5—Induction heating is admirably adapted to production line set-ups, eliminating the storage and furnace space required for batch hardening.

6—Uniform case depth and surface hardness substantially contribute to reduction of rejects.

7—Because heat is developed only during actual hardening, the maintenance of heat during non-productive periods is eliminated.

Rocker arm adjustment screws which required a hardened ball, without change in the original structure of the threaded portion, represent a typical application. Formerly the threaded portion was copper-plated, the ball end was carburized and hardened, and the copper plate was then stripped away. This method using two heatings, however, distorted the threads and, since a thin carbon-proof plate is difficult to place on the threads, hard spots developed which caused easy breakage of the adjustment screw.



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SPECIAL TOOLS

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Staples superiority is the result of diamond lapping of Carboloy Cemented Carbide tips, copper brazed to steel for braze strength, and the fine grinding of flutes for free passage of chips. Uniform excellence of diamond ground cutting surfaces means many more pieces before regrounding.

Any job that justifies a special tool is entitled to no less than Staples Tool precision.

Staples Special Tools and the line of Staples Standard Tools are widely used in American Industry . . . where stepped-up reconversion activities call for faster operations and the highest quality.

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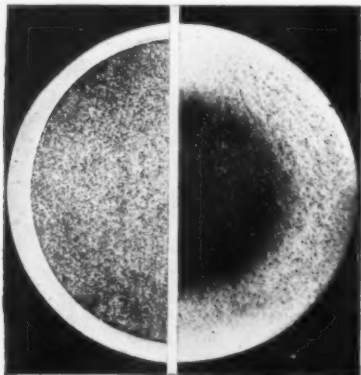
WHATEVER YOUR MACHINING PROBLEM

—however complex—Staples Special Tool engineering facilities will help you solve it.

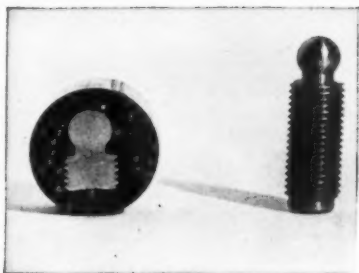
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SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS**

By induced heating of only the ball end of the screw, distortion of screw threads and annoying hard spots were avoided. In addition to eliminating the copper plating, carburizing, and strip-



CONTROLLED HEATING of king pin gives thin, hardened surface with a ductile core (left micro-photograph section) while conventional methods let heat penetrate into core (right) to make contact brittle and weak.

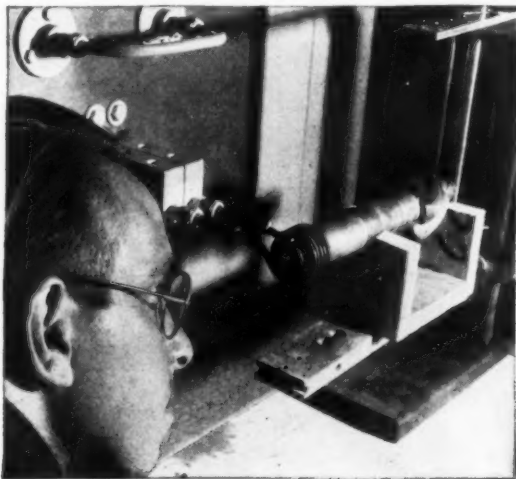


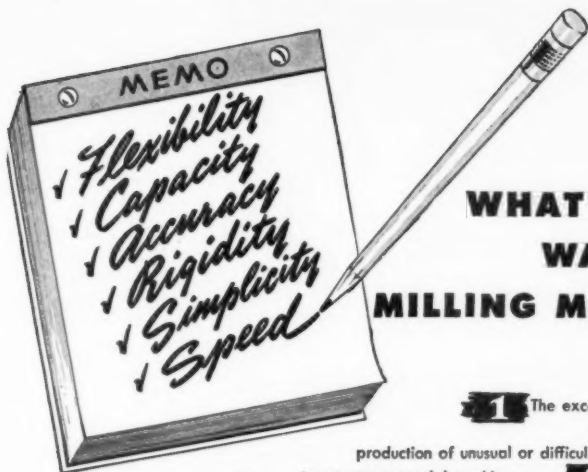
CROSS-SECTION of rocker-arm adjustment screw shows the ball end hardened without any distortion of threads.

ping processes, roughly 20 percent of the former Btu was required.

Work - handling equipment with a conveyor can be set up in such applications to carry screws directly from the screw machines to the induction heater. A standard 20 kw induction heater is capable of hardening these screws at the rate of 200 pieces per minute, adequately handling the entire output of a normal battery of screw machines.

THREADED END of a pinion shaft is annealed to remove hard spots and to relieve any stress set up during machining and heat treating. Annealing of sheet, rod, and bar stock is a large field for heating by induction.





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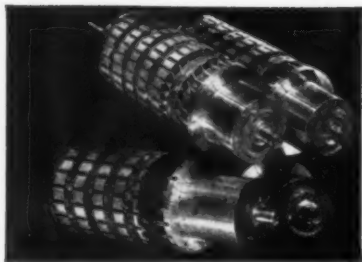
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STARTING MOTOR ARMATURES have proved to be better, both electrically and mechanically, when joints between armature coil and commutator bars are brazed by induction heating. Segments, brazed one at a time, require 15-20 seconds each.

Thrust bearing surfaces present another problem. In one case the two side surfaces of a thrust bearing were to be hardened $1/32$ to $1/16$ " deep to 58-62 Rockwell "C" and SAE 1144 steel was used.

By rotating the bearing in the work coil, heating and hardening were confined to the side surfaces without ex-

cessive heating of other shaft surfaces. Only three seconds for heating and another three to five seconds for water quenching were required. An automatic timer controlled heating and quenching cycles for absolute uniformity of the charge.

Annealing applications

Annealing of sheet, rod, and bar stock is another large field for induction heating. In such operations it is necessary to heat the entire mass, so no saving on the cost of heat occurs, but the ability of heating by electrical induction to fit into a production line set-up more than offsets the higher cost of heat. Annealing on a line set-up removes the necessity of working with batch lots, avoids excessive handling, and greatly reduces overall time. In addition, regulators and electronic controls can make the entire operation automatic.

Pinion shafts are customarily subjected to the carburizing process, with its subsequent distortion and hard spots

LESS than 10 seconds brazes water jacket to diesel engine cylinder.



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**No Shop
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to be
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This Fellows Involute Measuring Instrument pays for itself quickly in any shop making high precision gears. It detects errors before they cause costly rejects—and puts you in complete control of accuracy with less "fuss and flurry" than any other device for a similar purpose. Literature on request.

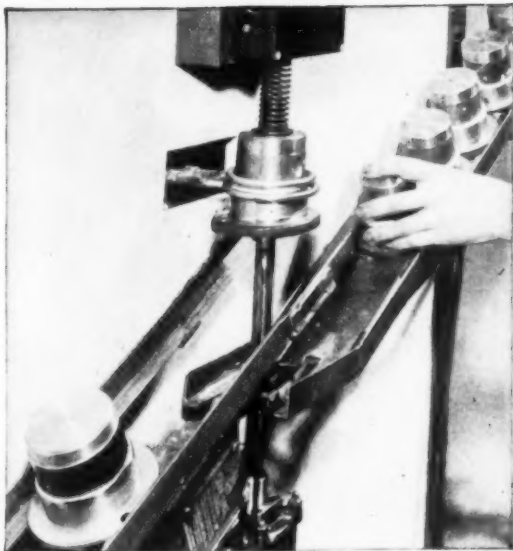
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on threaded parts. Annealing of the threaded end of the pinion shaft becomes necessary to remove these hard spots, as well as to relieve any stress set up during machining and heat treating.

By designing work handling equipment with a conveyor to place pinion drives in the work coil, four or five arms can be heated simultaneously at a rate of one every 15 seconds.

In annealing gears, the entire gear was initially case hardened to a depth of .030 to .040", leaving the internal surfaces to be finished. Machining economy demanded that the hardness of these surfaces be drawn from Rockwell 60 "C" to 30 "C" or lower. The remaining surfaces should not be drawn. The problem, therefore, was to confine the heat to the desired area and to raise it rapidly to the required temperature



KUTMORE ADJUSTABLE HIGH SPEED HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery — even on specials. Write for Catalog No. 15.

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where . . . and the file is immediately rejected.

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TYPE A—STEP JAW DESIGN: Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Length Overall
1A	$\frac{1}{2}$ " to $\frac{3}{4}$ "	9"
2A	$\frac{1}{2}$ " to $1\frac{1}{4}$ "	11"
3A	$1\frac{1}{2}$ " to $2\frac{1}{4}$ "	12 $\frac{1}{2}$ "
4A	$2\frac{1}{2}$ " to $3\frac{1}{2}$ "	20 $\frac{1}{2}$ "
5A	3" to 4"	21"



TYPE B—STRAIGHT JAW DESIGN: Adapted for work with both short and long bores.

Size No.	Range of Bores Taken	Length Overall
1X	$\frac{1}{2}$ " to $\frac{3}{4}$ "	5"
2X	$\frac{3}{4}$ " to $2\frac{1}{32}$ "	6"
3X	$2\frac{1}{32}$ " to $\frac{3}{16}$ "	6"
00	$\frac{3}{16}$ " to $\frac{7}{16}$ "	8 $\frac{1}{2}$ "
0	$\frac{7}{16}$ " to $1\frac{1}{2}$ "	8 $\frac{1}{2}$ "
1	$1\frac{1}{2}$ " to $1\frac{3}{4}$ "	9"
2	$1\frac{3}{4}$ " to $1\frac{15}{16}$ "	11 $\frac{3}{4}$ "
3	$1\frac{15}{16}$ " to 2"	13 $\frac{3}{4}$ "
4	2" to $2\frac{1}{2}$ "	17 $\frac{1}{4}$ "

Other sizes taking up to 7" bores. Set of 19 Nicholson expanding mandrels does work of 209 solid arbors. Sold singly or in sets. Bulletin 1043.

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in order to prevent any appreciable conduction of heat to the other surfaces.

A single turn internal work coil was employed and the gear was revolved to obtain a uniform heating pattern. Less than 30 seconds was needed to anneal the surface to the depth required for machining. Thus the ability of induction heating equipment to produce a continual flow of material for the assembly line again proved to be of considerable advantage.

Brazing saves heat

In brazing operations, the heat developed is confined only to the brazing area, saving heat over the furnace or torch methods which heat the entire piece to brazing temperature. It is not unusual to find a saving of 75 percent or more in the number of Btu's required to do a given brazing job.

Similarly, because of the heat concentration and the higher power densities available (2 to 20 kw or more per square inch of surface area), brazing time usually consumes only a matter of a few seconds. The tremendous increase in production rates thus made possible, results in a substantial reduction in unit costs.

Brazing, when done with induction heating equipment, is easily accomplished by unskilled labor. The operator applies flux to the components to be brazed, places a preformed ring of brazing alloy in position, assembles the components, puts the assembly in a work coil, and turns on the power. Work frequently can be set up on an automatic or semi-automatic basis.

Invariably the uniformity and quality of brazing far surpasses that of any other method. Parts having properly designed brazed joints can be made as strong or stronger than similar pieces



Tolerances Worth Maintaining Are Worth Jo-Block Protection

When you set up dimensional inspection tolerances, it's to insure a specified class of fit in assembly, or to make sure of parts-interchangeability, or for some other good reason. The harder it is for an inspector to be *sure* he's staying within limits, *the more it costs*.

So, why not put a set of Ford Jo-Blocks on guard? Make it part of somebody's routine to check every working gage—whether snap-gage, micrometer caliper, dial indicator, plug-gage, ring-gage, or any other dimensional test device—with genuine Ford Jo-Blocks at definite, frequent intervals. Then, you'll *know* that everybody concerned is "speaking the same language" of measurement. Chances are that inspection will speed up and rejections will be fewer.

Jo-Blocks are not expensive. They're made to three warranted accuracy standards—plus or minus .000002", .000004" and .000008". Sold throughout the Americas as single blocks or in sets (metric measurement, too). Many accessories available to expand and facilitate use of Jo-Blocks.

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machined from one-piece stock. Since manufacturers have discovered that important savings in machining and material costs can be realized by the use of induction heating equipment, many complex machining jobs have been redesigned to take advantage of these savings.

Brazing of four nipples and one seam on a mixing chamber, for example, was formerly done, one area at a time by a gas torch, requiring from 1½ to 3 minutes for each of the five brazes. By induction heating, three threaded nipples brazed simultaneously took 6-7 seconds, the bottom nipple needed 6 seconds, and the seam between the upper and lower portions took 10 to 12 seconds, making an actual brazing time of 22-25 seconds.

When all other work-handling time requirements were added, an increased production rate of 40-50 mixing chambers per hour was gained without additional labor costs over the 6-10 per hour produced by the torch method.

Brazing saves machining

Roller fabrication illustrates the saving that can be achieved by brazing several steel pieces instead of machining the components. A shaft is placed inside a cylinder with end bells put on each extremity. Both shaft and cylinder are simultaneously brazed to the end bells in two operations, each taking approximately 10 seconds. Since the heat is developed uniformly around the piece, the joints are pressure-tight and stronger than specified, no warpage occurs, and no stresses develop in the steel.

In brazing three nipples on a formed sheet metal container the brazed joints were required to be leakproof under considerable pressure. The two nipples on the top were simultaneously brazed in 7 seconds, while the bottom one

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These modern aids assure maximum chuck performance.

The ELECTRO-MATIC line of industrial rectifiers is designed for heavy duty service. The sturdy d-c current supply units are engineered to "stand up" day after day in the hardest usage. During the present shortage of small motor-generators, these efficient and dependable rectifiers are being used for many other industrial d-c applications.

NEU-T-ROL is the efficient modern method of releasing work pieces from magnetic chucks—and demagnetizing work pieces as they are released.

NEU-T-ROL saves time and tempers — eliminates marred, distorted workpieces and prevents damaging of chuck faces. NEU-T-ROL also protects chucks against harmful voltage surges.

NEU-T-ROL is fully automatic in operation, being scientifically time controlled. No human factors, such as delicate timing enter into its successful performance.

NEU-T-ROL chuck controls and ELECTRO-MATIC rectifiers can be installed easily on equipment already in use—or built into new machines before delivery, if you so specify.

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These sturdy, dependable industrial rectifiers are available in 42 models in capacities ranging from 125 to 3,000 watts.

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because it puts a production tool in your hands that is not yet in such wide use as it should and will be soon.



Ask for free information—

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took 5 seconds. Use of preformed brazing alloy rings reduced the procedure to fluxing the parts, assembling them, and brazing. Overall rate of production could be increased 500-600 percent without use of additional labor.

When a spline was brazed to a hub, an assembly equally as strong as a machined part was achieved, thus saving time and material. Preformed alloy rings were 1/32 to 3/64" silver solder and brazing time was only 12 seconds.

Starting motor armatures

High currents and speeds of starting motors demand that the joint between armature coil and commutator bars be of high conductivity and strength. An ordinary solder joint, however, is subjected to such high temperatures there is danger of centrifugal force pulling the coil out of the commutator slot.

Silver solder is ideal since its electrical resistance is almost as low as copper and its tensile and shear strengths greatly exceed that of soft solder. It needs, however, a temperature of 1175° F to melt it and cause it to flow. With ordinary brazing methods the copper of the armature coil and commutator conducts the heat away, necessitating long-time heating of the joint area. As a result of such heating, insulation between commutator bars is sometimes sufficiently damaged to cause short circuits.

Induction heating confined heat to the specific joint area without prolonged or excessive treatment. The armatures with flux and silver solder in place were mounted in a jig and brazed one segment at a time, with approximately 15-20 seconds needed for each braze. Results showed the armatures better both electrically and mechanically.

Plans for increased production by a company manufacturing tire pumps were delayed when their facilities for

ALL *You* NEED TO DO IS GET THE POPE SPINDLE THAT FITS THE JOB

Pope's large variety of types and sizes of Precision Spindles with Sealed Lubrication makes it a simple matter for you to get the right Spindle for your job. The four examples shown below give you some idea of the wide range available.

Simply send us a sketch with dimensions and the name of your machine, the method of holding the wheel or tool and the R.P.M. wanted. We will then submit recommendations with cost and delivery estimates.

These modern "Package Units" are complete, even to a sealed-in supply of lubricant good for the life of the bearings.



This POPE Sealed Motorized Spindle is recommended for all makes of 6" x 18" surface grinders. It has a 1 H.P. G-E motor and sealed-in lubrication, SKF super-precision, double row roller bearings. It assures finer finishes and more production per day and per Spindle.

This POPE Vertical Motorized Spindle, with Sealed Lubrication and with 3, 5 or 10 H.P. motor running a 1200, 1800 or 3600 R.P.M. is recommended for a broad range of surface grinder and boring applications. It has the bearing capacity and the rigidity to rough off surplus metal fast and produce a better final finish.

This POPE Internal Grinding Spindle with sealed lubrication and speeds up to 35000 R.P.M. is recommended for the production of more accurate hole sizes and better finishes. It comes in a wide range of sizes and speeds.

This POPE Cartridge Type Spindle, flange mounted in a heavy housing, is recommended as a headstock on special purpose, high production lathes and on boring machines.

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POPE MACHINERY CORPORATION

ESTABLISHED 1920

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DUPLEX**
BORING AND FACING TOOL HEAD

topping the pumps' cast iron bases and threading the sheet steel cylinders were found inadequate. By installing a 20 kw induction heater, fluxing pump bases and cylinders, assembling units with rings of solder internally placed, and soldering in groups of six, a mass production line which solders units in 1½ to 2 seconds time can be achieved.

Melting and preforming

Small batch rapid melting of metals is yet another field where induction heating is being applied. The ability to melt small batches rapidly and conveniently with a minimum of dust, dirt, and radiation to surroundings is a distinct advantage.

Manpower and time saving are the factors to be considered when discussing preforming heating. With proper controls, billets can be so regulated that they are at the proper temperature when they reach the forge. Units for induction heating are also so space-saving that they can frequently be mounted in the most convenient location with respect to the presses, reducing handling and heat loss as work is transferred to the presses from the furnace.

These applications of electrically induced heating are but a few of the many hundreds of products which can be brazed, soldered, annealed, hardened, melted or preheated for other metal processes. Metal working plants are building special laboratory and production facilities to conduct induction heating operations. Electrical utilities are assuming the responsibility for informing power users of developments in new equipment and possibilities of new applications.

Possible advantages to manufacturers are increased almost daily thru the experiments and field experience of engineering and research staffs.

(Illustrations — Courtesy Allis-Chalmers Electrical Review.)

THE Master Standards Room

... ONE OF THE MANY FACTORS IN
MAINTAINING BROWN & SHARPE ACCURACY

There's a room at the Brown & Sharpe plant where skilled inspectors perform an important function... the comparing of our *working standards* with master standards at regular intervals to protect the accuracy of Brown & Sharpe Tools. This room, maintained at 68°F... the temperature recommended by the American Standards Association, contains, in addition to the master standards, numerous specialized measuring machines required for the performance of such precise work—just one of the many factors contributing to the high standard of accuracy that has made Brown & Sharpe Tools the choice of three generations of machinists.

BROWN & SHARPE MFG. CO.
Providence 1, R. I.



WE URGE BUYING THROUGH THE DISTRIBUTOR

BROWN & SHARPE TOOLS

The CONE AUTOMATIC MACHINE COMPANY



sees many

GOOD THINGS AHEAD

It is reported that

U. S. Steel's Carnegie-Illinois has patented "Stainless W", a chrome nickel steel that can be heat-hardened.

get ready with CONE for tomorrow

"Homogenization", a familiar treatment for milk, is being tried by the Marco Co. of Wilmington for its effect on metal alloys, petroleum, rayon and chemicals.

get ready with CONE for tomorrow

General Motors' engineers state that diesel engines are now so refined that they are creating a demand for special fuels with specific properties.

get ready with CONE for tomorrow

Texas Industrial Co. of Houston, Texas, has developed a radial diesel aircraft engine, from government surplus, into a power plant capable of lighting a town with 300 population.

get ready with CONE for tomorrow

Glenn L. Martin Co. and U. S. Plywood have collaborated on a construction material in the form of a sandwich. The core is a honey-comb of impregnated cloth or paper and the surfaces are of aluminum, steel, wood or plastic.

get ready with CONE for tomorrow

A relay capable of speeds up to 1,000 operations per second has been developed by Stevens-Arnold.

get ready with CONE for tomorrow

Measuring 9 inches in diameter, a new hydraulic pump made by Hydraulic Machinery Co. of Detroit is said to develop 5,000 lbs. per square inch pressure.

get ready with CONE for tomorrow

B. F. Goodrich has broken ground for a new research laboratory on a 260-acre tract between Akron and Cleveland.

DuPont reports the development of porcelain enameling on aluminum castings.

get ready with CONE for tomorrow

The world's largest concrete dam and hydro-electric plant will be built by the Chinese on the Yangtze River.

get ready with CONE for tomorrow

Victor Division of RCA is using electronic heating to seal in the metal contacts in cathode ray tubes.

get ready with CONE for tomorrow

The new Crosley automobile engine is built largely of sheet steel stampings and develops 26 h.p. with a weight of only 59 lbs.

The City of New Orleans proposes to expedite its future traffic by building a tunnel under the Mississippi.

get ready with CONE for tomorrow

The "Quantometer" is made to analyze the amounts of each element in an alloy automatically and at production-line speed. It has been developed by the Applied Research Laboratories of Glendale, California.

get ready with CONE for tomorrow

A new Westinghouse device is said to snap an X-ray picture in a millionth of a second showing imperfections in parts under stress at high speed.

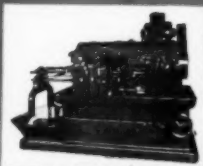
get ready with CONE for tomorrow

Peninsular Chemical Products Co. of Van Dyke, Michigan, has a new odorless, quick-drying maintenance paint that is proof against acids, alkalis and water and may be applied to wet, porous or heated surfaces.

Extra facility is extra value



This heavy compression nut from 7/16" hex stock, a job ordinarily assigned to lighter duty machines, was produced by a rugged 1/2" 4-Spindle Conomatic at the rate of 4 seconds each—fifteen per minute.



Write to Cone for particulars.

Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDBOB, VERMONT, U.S.A.



SKILTOOL CLINIC CUTS YOUR COSTS!

● Here is a wonderful opportunity for operating men to find out the newest ways to cut costs throughout your plant by wider use of fast-working SKILTOOLS on both production and maintenance. Your distributor will hold a SKILTOOL CLINIC in your plant. You'll see all the new SKILTOOLS in action . . . see how they make countless jobs easier . . . how they *step up the hourly output per worker*. A specially trained SKILTOOL Engineer will accompany your distributor at your clinic and work directly with your foremen in selecting the right tool for the job . . . give valuable tips on tool care . . . assist your staff in bringing down increasing hourly costs!

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Factory Branches in All Principal Cities



Mail This Coupon Today!

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.

We would like to have our distributor conduct a cost-cutting SKILTOOL CLINIC in our plant on or about (date)

Name

Address

City State

PRESS-RITE PRESSES

for
**PUNCHING
FORMING
BLANKING**



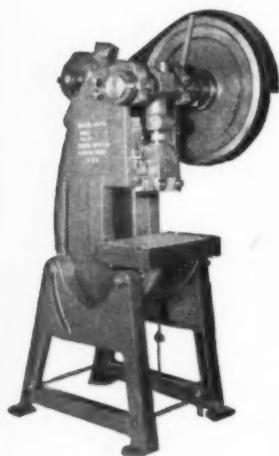
No. 0—5 ton

*Open Back
Inclinable*

*Built in
Three Sizes*



No. 1—10 ton



No. 2—18 ton

Press-Rite Presses are precision built and can be run at reasonably high speeds, will do light work with large size dies. All models can be equipped with V belt, motor drive and motor bracket, plus a fabricated steel guard arranged so that the operator can use the flywheel for setting and changing dies. Latest design, simple and rugged construction, durable and dependable.

For complete information

See your local dealer or write direct to us.

SALES SERVICE MACHINE TOOL COMPANY
2426 UNIVERSITY AVENUE **ST. PAUL 4, MINN.**

Operators in the assembly line of the wax department inspect the wax patterns as they move by on the conveyor belt. The patterns are then assembled to gates and risers by "wax welding", and are mounted on wax hubs molded especially for the purpose.



HOW HAYNES STELLITE MAKES HIGH PRECISION CASTINGS

HIGH precision castings are now being made on a production basis at the Haynes Stellite plant in Kokomo, Ind. These castings reproduce with remarkable fidelity, every complicated curve and angle of the master pattern, and they require little or no subsequent machining or grinding. The materials of which they are cast include Haynes Stellite Cobalt-base alloys, Hastelloy nickel base alloy, Hascrome Iron base composition and other Haynes high temperature alloys and stainless steels.

The "Investment casting" process used frequently is called the "Lost Wax" process. This method has been

employed widely in dental and jewelry work, but it remained for Haynes Stellite Company to apply it on a large scale commercial basis.

The first operation involves preparation of one or more master patterns which are replicas of the parts desired, except that they are approximately $1\frac{1}{2}\%$ oversize. This allowance is to compensate for wax and metal shrinkage.

From the master pattern a soft metal die is cast. Generally there are from one to 20 cavities in the die, depending on the size of the part. It is desirable to

get as many pieces into the die as is practical, since with more cavities, each wax injection produces more wax patterns.

Wax is injected into the die, the wax patterns are removed, inspected, and placed on a conveyor belt. The wax patterns are assembled by "wax welding" to gates and risers as they go down the conveyor belt. The assembly



The assembly is then dipped in a very fine silica suspended in a suitable medium. The presence of this fine material next to the wax is responsible for the smooth finish of the castings since, when the wax later is melted out, this is the surface on the inside of the mold which will be adjacent to the molten metal.

is dipped in a very fine silica solution. The presence of this fine material next to the wax is responsible for the smooth finish obtained on the surface of the castings, since when the wax is melted out, this is the surface that forms the molten metal.

The pouring mouth of the assembly is sealed to a steel plate and the assembly is carried thru a dehumidifying tunnel by the conveyor belt. A Hastelloy C flask, lined with wax paper is



The wax pattern is removed from the die and any cores that are used also are removed. The wax gate is manually broken off. These wax patterns are replicas of the master patterns.

placed around the assembly and sealed to make sure it is liquid tight.

The flask containing the wax assembly is then carried by means of a hanger conveyor where it is filled with a chemically hardening investment material. The mold, after it is filled with investment, is placed on a vibrator to pack the investment tightly around the wax



The "stuccoed" assembly is carried thru a dehumidifying tunnel by the conveyor belt. This drying process takes 22 minutes.



The flask containing the wax assembly is then carried by means of a hanger-conveyor to the next department, where it is filled with a chemically-hardening investment material.

pattern, and to make sure that all air is removed.

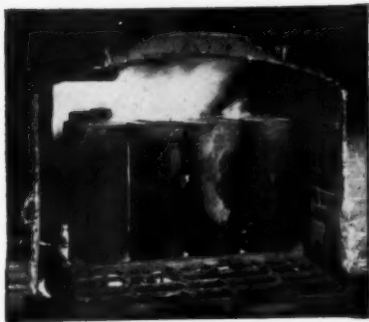
After about one hour the investment has galled, and all the fines have risen to the top. The excess investment material is cut off and the mold is allowed



The castings are then returned to the inspection department, where they are checked visually and dimensionally.

to age for several hours. The steel plate is then knocked off, exposing the pouring mouth into which the metal ultimately will be poured. Then the molds are placed upside down in a continuous furnace and the wax is melted out. Later any residue is burned out as the mold progresses into the hotter zones. The molds are heated from 1300° to 1900° F. depending on the parts to be cast.

Accurately weighed charges of the desired alloy are in the meantime being melted in small indirect arc furnaces. The heated mold is placed directly over the pouring spout of the furnace after the temperature of the metal in the furnace is checked with an optical py-



As the molds progress thru the hotter zones of the furnace during the heating cycle of several hours, the wax is burned out. The molds are heated from 1300 to 1900 deg., depending on the part being produced.

rometer. Correct mold and pouring temperatures control grain size and assure good metallurgical characteristics.

After the mold is clamped on the furnace, the metal is poured by inverting the entire furnace, and air pressure is turned on. The air pressure makes it possible to cast extremely thin edges, and also helps to produce sound and



When the metal reaches the correct temperature, as checked by means of an optical pyrometer to ensure proper grain size and other desired metallurgical properties, the hot, baked mold is inverted and placed directly over the pouring spout of the furnace. After the mold is clamped on the furnace, the metal is poured by inverting the entire furnace, and air pressure is turned on. The air pressure makes possible the casting of thin edges and also makes the metal sound and dense.

dense castings. The mold is allowed to cool slowly and after about four hours the entire casting assembly is knocked from the mold. The excess investment material is then removed and the cast assembly is carried by conveyors to a point where gates and risers are cut off with high speed abrasive cut-off wheels.

The castings then are shot blasted. Following this they are rough inspected.

Castings that pass this rough inspection are sent to the grinding department, where the gate areas are smoothed and surface irregularities are removed. The castings then are sand blasted and returned to the inspection department where they are visually and dimensionally checked. Castings passing this inspection are subjected to Zyglo, which is a fluorescent penetrative oil test revealing cracks or other surface imper-



The

PRUTTON

Tapmaster • • •



3 TAPPING MACHINES IN 1

Speedy; can do three jobs at once, tapping any size hole up to $\frac{7}{8}$ ". Three separate motors. Single or continuous cycle. Positive feed by husky lead screw prevents tearing of threads. Safe—no jamming of work. Ample tanks for coolant oil—ready accessibility. Descriptive bulletin. $\frac{3}{4}$ " awning eye-end and $\frac{3}{4}$ " pipe cap; 1500 per hour on Tapmaster.

D. H. Prutton Machine & Tool Co.
5295 West 130th St., Cleveland 11, Ohio

- POWER
- PRECISION
- SPEED



GOOD CHUCKS

ARE ESSENTIAL TO LOW COST PRODUCTION

POWER to take fast, heavy cuts...to turn a hot chip that makes the coolant smoke...

PRECISION that holds each one of a million work-pieces in exactly the same relation to the tool...and cuts down your percentage of rejects...

SPEED that gets a finished work-piece *out* of the chuck and a rough one *in*, in a matter of seconds...

These three factors are built into Cushman Chucks.

Before you decide on chuck equipment for those new machines, consult the Cushman engineers; they can provide special work-holding devices that will help you toward high accuracy, high volume production at low unit costs. Consult us on any work-holding problem.

**THE CUSHMAN CHUCK CO.
HARTFORD 2, CONN.**



A WORLD STANDARD FOR PRECISION

**CUSHMAN
CHUCKS**

THREAD-ALL Tapper



PRECISION TAPPING !! LICKED !!

**By Converting Any Drill Press into
a Precision Tapping Machine.**

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to 1½" with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

Taps right or left hand without adjustment.

Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

Write for full details.

GRUEN GAUGE CO.

10039 Marcus Ave.

Detroit, Mich.

fections in non-magnetic materials. The castings are then X-rayed and the sound ones are shipped.

In telling about the development of the process W. O. Sweeney, Haynes Sales Engineer explained that precision castings by the "Lost Wax" process have been made experimentally at the Kokomo plant since 1937. However, it wasn't until after our entry into the

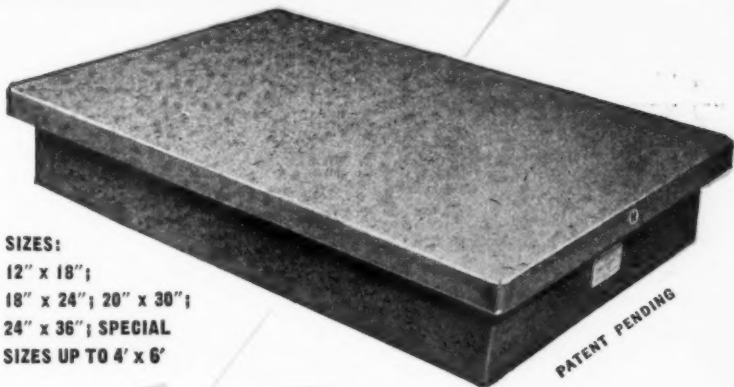


The castings that pass visual and dimensional inspection are subjected to Zygo inspection. This is a penetrative oil test which, under black light, reveals cracks or other surface imperfections by a fluorescent effect.

war that real mass production was achieved.

At first the only major production item was a turbo-supercharger bucket made for General Electric, Ford, and Allis-Chalmers. Early use of the process on a production scale revealed many problems that had to be solved, and in the earliest days the daily shipments of good buckets could be carried

DEPENDABLE MEASUREMENTS



SIZES:

12" x 18";

18" x 24"; 20" x 30";

24" x 36"; SPECIAL

SIZES UP TO 4' x 6'

Cut Rejections 80%

HERMAN Precision Granite SURFACE PLATES

Economical — Non-Magnetic — Accurate to 50/1,000,000ths inch

Faster, more accurate work with increased production and a big saving on gauge blocks and precision instruments — these are only a few of the more important advantages reported by users of Herman Precision Granite Surface Plates.

Cut from solid blocks of a specially selected natural bedrock granite, Herman Precision Granite Surface Plates are warp-proof, permanently flat and accu-

rate to 50/1,000,000ths inch. Being non-magnetic, they cannot become charged with filings and emery dust; unaffected by ordinary temperatures, rust or corrosion, they outwear ten ordinary cast iron surface plates — yet they cost no more.

Literature and prices will be mailed promptly in response to your request. Ask about our plan for a shop test in your own plant at our expense.

Nationally known users of

**Precision Granite
SURFACE PLATES**

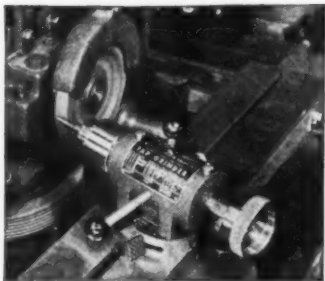
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Chrysler Motors
Ford
General Electric
Westinghouse Electric
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Bendix
Eastman Kodak
Maytag Company
U. S. Bureau
of Standards

The Herman Stone Co.

324 Harries Bldg., Dayton 2, Ohio

DON'T DISCARD DULL TAPS



Can be used on almost any type of tool and cutter grinder, surface grinder—even bench lathes. Tap is held in chuck—may be sharpened after center is destroyed. **No collets.** Complete. No extras. Write!

- Built-in chamfer protactor.
- Simple shifter for 2-4 flute taps.
- Variable relief thru adjustment screw.
- Easy - to - follow chamfer diagram on index plate.
- Capacity to $\frac{3}{4}$ " hand tap.

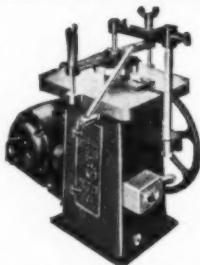
ORDER NOW!

READING TAP GRINDER

Including Chuck, Complete, No Extras

READING BROACH KEYSEATER

The Reading Bench Machine does not require bushings or guides. No other machine like it. Very fast capacity from $\frac{1}{8}$ to $\frac{3}{8}$ cutter. Low first cost — prompt delivery.



READING MACHINE CO.

READING (CINCINNATI) OHIO

out in a man's hand. However, after some months of concentrated effort, production was increased and in all, a total of some 25 million buckets were made.



Trays of castings are passed thru automatic X-ray equipment for the final check on quality.

In the later part of 1944 the bucket program was cut back and three additional programs were started, involving an important ordnance part, turbine blades and turning vanes for jet engines.

With the ending of the war the demand for precision castings underwent another transition. Many companies are now investigating the gas turbine field and Haynes is making precision castings for most of them. Some of the designs are quite radical including many hollow buckets.

Also with the ending of the war, the process is now available for other applications and these include an extremely wide range of parts.

The process is especially advantageous for shapes that are difficult to machine, fabricate, form or forge, or for alloys which are difficult to machine, grind, form, or forge. All of the jobs are carefully engineered. An active quality control department sees that the highest precision standards are maintained.

HEAT TREAT SMALL PARTS

In Your Own Plant

ESSENTIAL FOR TOOL AND DIE SHOPS

You save time and money heat treating small tools and dies in a Cooley Electric Furnace. Uniform temperatures are maintained throughout the furnace chamber to assure even heating of parts. The heating elements are embedded in refractory materials, protecting against atmospheric attack. They are easily replaceable.

ECONOMICAL TO OPERATE

To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. The MH-4 furnace requires less than 2.5 kw. or under 5c per hour at the same rate. Cooley Furnaces are easily installed—ready for immediate service by connecting power lines to two terminals. Quiet in operation—no fumes or odors—no ventilating necessary—they can be located at any convenient place in the shop.



TWO NEW OPTIONAL FEATURES AVAILABLE



1. Vertical Lift Door—Counter weighted for ease of operation—conserves heat where door need not be fully opened to enter or remove work. Supplied in place of standard hinged hearth door at \$20.00 additional to regular furnace prices shown below.



2. Heavy Gauge Steel Stand—For ease of installation and operation—locates furnace at most convenient operating height and provides additional working and storage space. Add \$35.00 to regular furnace prices shown below.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$146.00*
MH-4	10"W 6"H 18"L	4800	20.9	\$222.50*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire—approximately \$150.00.

NO SALESMEN WILL CALL

Ask for free information and ordering instructions so you can make your own decision and determine your own requirements. Write for Bulletin No. 50 today—no obligation.



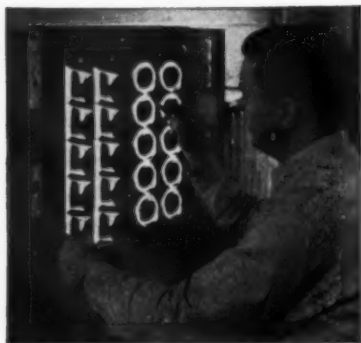
COOLEY ELECTRIC MANUFACTURING CORP.

20 South Shelby Street

Indianapolis 7, Indiana

Export Department, 1111 S. Ferry Building, New York 4, New York

Currently, the largest part that has been made is a propeller hub, weighing approximately three lbs. The process is gradually being extended into heavier castings. Before long it is likely that casts weighing three to five lbs will be cast regularly. In fact, five lbs is the limit that can be handled with the present design of pressure casting furnaces. By conventional gravity-pour methods there is no furnace weight limitation.



Trained operators check all X-ray negatives closely for flaws that would make the parts unsuitable for use.

There is no minimum weight within reason and a number of parts are being made which weigh only .002 lbs which means 500 pieces to the pound. Likewise there is no current limitation on minimum size, within reason, and edges as

thin as .012-.015" are being cast in production. The current maximum dimension is approximately seven or eight inches in any one direction.

The precision casting process opens a new era for design engineers in that they may now use alloys not previously available because they could not be made readily into the desired shapes. Furthermore, there is practically no limitation as to designs which can be made, since precision casting permits the making of intricate contours and shapes that were not practical hitherto, on a production basis, of any alloy. For example, in the steam turbine field the Design Engineer has been limited to shapes and alloys which could be milled or extruded. Now he can design for maximum efficiency by incorporating all the angles he wants and using a super alloy for higher temperature and pressure because the part can be cast by this precision method.

This is only a part of the picture of the activities at Kokomo where in addition to a mounting production of precision castings, there is much activity in the Stellite cutting tool, hard facing alloys and welding rod fields.

CRANK SHAPERS

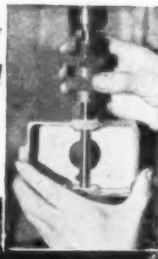
S & M catalog 45, with 24 pages, contains data, illustrations, drawings and specifications regarding the 12", 16", 20", 25", 28", and 32" Crank Shapers made by Smith & Mills Co., 2893 Spring Grove Ave., Cincinnati 25, O.

How to remove burrs - FASTER, EASIER, BETTER!

With the new NOBUR tool you can burr holes faster—improve the finish of deburred parts and lower production costs by eliminating burring as a bench operation. The NOBUR tool works like a drill, making burring a fast, easy machine operation. The NOBUR tool is available in 1/16" progressive sizes from 3/16" to 1" in diameter. Write today for new complete burring folder.

NOBUR MANUFACTURING COMPANY

910 North Orange Drive, Los Angeles 38, California



Your IDEA OF A REAMER

The moment you look at one of these new Daniels Reamers you'll recognize it as the kind of precision tool you'd turn out yourself, if, like us, you concentrated all your skill and resources on the grinding, heat treating and finishing of these fine reamers.



TRY IT AND SEE!

Daniels Reamers are accurate to .0002". You can count on their sustained performance and low cost per cutting hour. They're *your* idea of everything a reamer should be.



GET THIS BULLETIN
containing complete information on
types, sizes and prices.



DANIELS REAMER SETS
come packed in sturdy, handy
cases. Every shop needs one
or more of these utility sets.

Daniels Precision Reamers are sold only through top grade mill supply distributors. Let us put you in touch with the one nearest you so you can try Daniels Reamers and judge the results for yourself.

N. J. DANIELS TOOL CO., INC.

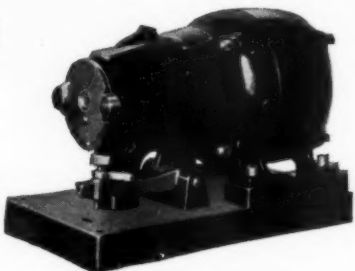
67 WASHINGTON STREET, HAVERHILL, MASSACHUSETTS

ZIP .. and It's Done

Yes, zip, it's done—that's how the Weber Perfection Wire Stripper removes insulation from the ends of solid, stranded or multi-conductor cable and wire. Takes any size up to half-inch diameter.

It's a Precision Stripper ruggedly built—and so simple your most unskilled employee can operate it. Get your wire stripping done quicker, better, save money, speed up production.

Your first step is to write for information.



**PERFECTION
WIRE STRIPPER**

WEBER MACHINE CORPORATION

59 Rutter St.

Rochester 6, N. Y.



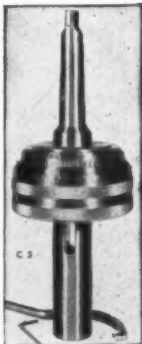
Why BREAK 'em ?

**HOW MUCH DOES IT COST YOU
TO REPLACE BROKEN DRILLS,
TAPS, REAMERS, ETC.?**

Added to losses due to work spoilage, labor of extracting broken pieces and production line tie-ups, it can be a formidable total.

You can cut these mounting losses easily by the use of BUFFALO TORQUE CONTROL COUPLINGS. Adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when overloaded, thereby releasing the driving power thru the couplings themselves, but automatically re-engaging and re-assuming the driving power when the over-load has been removed.

Available in production and utility models, in sizes for all operations on drilling machines, lathes, turret lathes, boring mills, etc. Also manufactured as stud drivers, nut setters and transmission types.



Machine Tool Type
Utility Model

Descriptive Bulletin No. 1007 sent on request

BUFFALO MACHINERY CO., INC.

839 Grant Street

Buffalo 13, New York

Cut Production Costs

with

BERKELEY DRIVES

That's exactly what was done by the owners of the machines shown on this page. To a great extent, machine tool performance depends on the drive equipment. With the right drives, you can step-up production by using modern carbide tooling.

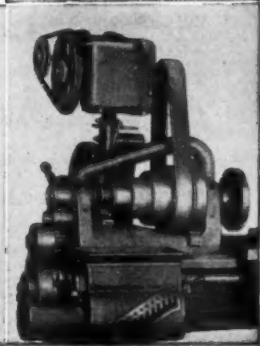
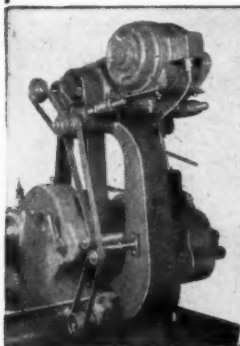
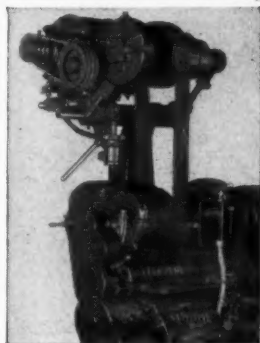
Berkeley can supply drives for practically all machine tools. Each drive is individually engineered to enable your tools to give maximum performance.

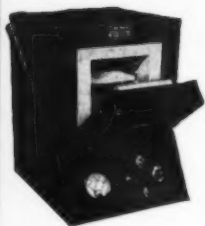
Low in first cost, Berkeley drives are easily installed and economically maintained.

You'll make no mistake in putting your drive problems up to Berkeley—there's no obligation.

Let us send Bulletin
showing typical installations.

BERKELEY EQUIPMENT CO.
1022 BAHLS ST., DANVILLE, ILL.





LUCIFER

ELECTRIC HEAT TREATING FURNACES

WITH AUTOMATIC HEAT CONTROL

SPECIFICATIONS

- Interior size—Model 7051— $5\frac{1}{2}$ "x $5\frac{1}{2}$ "x6"
 - Exterior size—15"x15"x17"
 - Operation—110 V. A.C. only
 - Rating—1.2 K. W.
 - Ship. Wt.—Approx. 85 lbs.
 - Operating cost—Approx. 3c per hr.
- PRICE \$112.00, f.o.b. Factory, Philadelphia

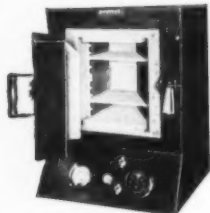
Just what you have been waiting for. Electric heat treating furnaces that are easily operated; you can do your own heat treating—harden and temper dies, punches, gauges, jig and fixture parts, normalize weldings and castings. It's easy with a "LUCIFER" because it has the "LUCIFER" automatic electric heat control that permits stepless control of any predetermined heat within its range up to 2000° F. All "LUCIFER" furnaces are equipped with indicating built in pyrometers calibrated both in Fahrenheit and Centigrade, pilot light, control switches and automatic control devices. Heating elements are easily replaced after long life. "LUCIFER" furnaces are unconditionally guaranteed to give you satisfaction, and are in use by some of the leading manufacturers all over the country.

SPECIFICATIONS

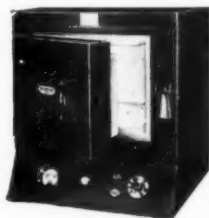
- Interior size—Model 7053—8"x8"x10"
 - Exterior size—18"x20"x24"
 - Operation—110 V. A.C. or 220 V. A.C.
 - Rating—3 K. W.
 - Ship. Wt.—Approx. 225 lbs.
 - Operating cost—Approx. 6 to 8c per hr.
- PRICE \$188.00, f.o.b. Factory, Philadelphia

SPECIFICATIONS

- Interior size—Model 7052—12"x12"x10"
 - Exterior size—22"x22"x24"
 - Operation—220 V. A.C.
 - Rating—4.8 K. W.
 - Ship. Wt.—Approx. 350 lbs.
 - Operating cost—Approx. 10 to 14c per hr.
- PRICE \$260.00, f.o.b. Factory, Philadelphia



DEALERS:
Write for our interesting offer to qualified distributors. Desirable territories open.



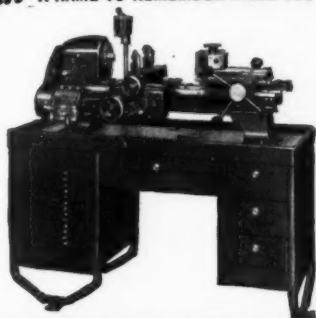
Distributors

West Coast.....REAGAN CO., 6409 Santa Fe Ave., Huntington Park, California
N. Central.....The Satterlee Co., 118-20 Washington Ave. N., Minneapolis, Minn.
East Coast.....Wilson Steel and Tool Co., Commercial Trust Bldg., Philadelphia, 2 Pa.

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401 N. BROAD ST., PHILADELPHIA 8, PA.

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES



At these 39 points* this Logan Lathe has self-lubricating (bronze bearings)

LOCATION	NO. BEARINGS
Underneath Drive	8
Reverse Gear Bracket	2
Gear Box	10
Headstock	7
Automatic Apron	6
Carriage Assembly	4
Turret Assembly	2
TOTAL	39

*All models of Logan Lathes are similarly protected.

SELF-LUBRICATING BRONZE BEARINGS

**KEEP LOGAN LATHES READY TO RUN,
ADD TO SERVICE LIFE,
NEED FAR LESS OILING**

The use of self-lubricating bronze bearings in place of plain bearings is typical of Logan Lathe design. The self-lubricating bearings are of a special bronze that is absorbent in texture and impregnated with lubricant. As a shaft revolves in one of these bearings, the lubricant is gradually released in a self-controlled flow which keeps an even film of oil over contacting surfaces. In this way, even though the lubricant is only infrequently renewed, the bearing surfaces are protected. In addition, the spindle on every Logan Lathe revolves on precision preloaded ball bearings that never need lubrication. This sustained lubrication is another factor in the sustained accuracy and long life of Logan Lathes. Get the full story of the advantages offered by the complete line of Logan Lathes from your Logan Lathe dealer, or write for a catalog.

SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 10½" . . . bed length, 43½" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 1½" — 8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision-ground ways, 2 V-ways, 2 flat-ways.

J-2

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

GEROTOR

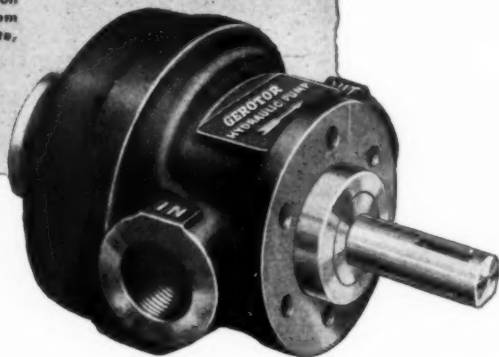
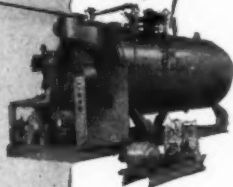
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STEAM GENERATORS

Gerotor Hydraulic Pumps are taking on new tasks in many fields of peacetime industry. On Cyclotherm Steam Generators, for example, Gerotor's dependable operation eliminates the hazard of pump failure when the Cyclotherm is called on to generate steam at high efficiency.

Gerotor's unsurpassed record of top performance and low-cost operation makes it the preference of industrial leaders who have intricate pump problems. If you have a difficult hydraulic pump application, place it before Gerotor's staff of engineers. There is no obligation—no delay. Your problem will be given immediate, courteous attention.



GEROTOR MAY CORP., BALTIMORE 3, MD., Plants at Logansport, Ind., Baltimore, Md.

Versatility of the Ball

By H.F. WILLIAMS

IN the series of articles under this title appearing in the BLUE BOOK beginning in June 1945 and ending in March 1946, numerous applications of the use of balls in industry were illustrated. Several others have been brought to my attention subsequently which are worth mentioning to round out the series.

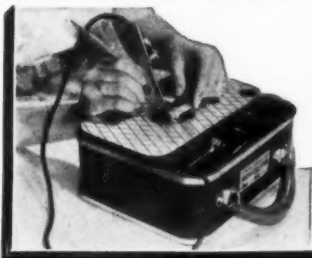
One correspondent explains that he applied a 5/16" ball to the end of the propeller shaft of an outboard motor. This ball was inserted at the end of the gear shaft fitting into the 120° included angle at the end of the reamed hole for the radial bearing. This ball therefore took up all the gear thrust and also kept the teeth from bottoming. Altho loaded to an estimated drag of 2000 pounds, the installation has given every satisfaction for the past four years.

In a recently announced plug gage, hardened steel balls facilitate entering the plug into the hole to be gaged. Of British design, the Emmerton plug gage, distributed by Taft-Peirce Mfg. Co., Woonsocket, R. I., helped greatly in the war effort in England.

This ball bearing plug gage has an annular row of balls located at the front or entering end. They are so re-

tained that they are free to rotate in any direction and even tho the plug approaches the hole at an angle to its axis, the balls guide the gage into correct alignment. Because the balls are free to turn, entering wear is distributed over the entire surfaces of the balls. Therefore the surface of the gaging plug beyond the row of balls is said to have unusually long life. Claims are made of very accurate gaging, in that a hole can be gaged with exactly the same sized plug. Ordinarily under such conditions, the plug seizes in the hole if movement is stopped. These ball piloted plug gages are available in diameters as small as 1/4".

In the No. 100 series of automatic self-opening stud drivers, manufactured by the Titan Tool Co., Fairview, Pa., as advertised in this magazine, two sets of hardened and ground steel balls are used to set the stud. The upper set of balls locks the jaws in full register on the stud. Then the lower set of balls acting as the drivers, pull the jaws up into a tapered nose bushing. Subsequently the stud is driven to its correct depth. Incorporated in the mechanism is an automatic take-up to compensate for wear on the jaws. When driving shoulder studs, the controlled drive stud driver has an adjustable over-running



ANNIS Production Type ELECTRIC ETCHER

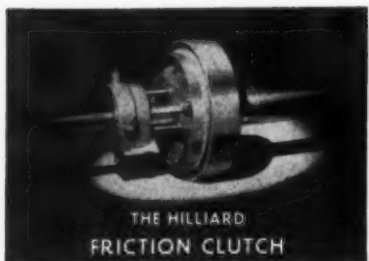
SPECIFICATIONS—Navy bronze contact plate; Aluminum alloy case 4" x 8" x 10"; Weight 22 pounds; Recessed, heavy duty heat selector switch and pilot light; Handy cord storage compartment; Special current regulating transformer gives smooth etching action with the offset, cooling stylus. For operation on regular 110-volt AC lighting circuits. Fully guaranteed. Price \$67.50. Immediate delivery.

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CENTRIFUGAL CLUTCH

Hilliard Centrifugal Clutches and Couplings have a minimum number of parts and a wide range of adjustment. They are ideal for high speed dual drives, automatic engagement on internal combustion engine drives, starting high inertia drives, and many other purposes.



THE HILLIARD
FRICTION CLUTCH

Hilliard Friction Clutches and Couplings are especially suitable for drives requiring smooth clutching and infrequent clutch adjustment. Their rack and gear mechanism permits very slow engagement of friction surfaces, resulting in extremely smooth load acceleration, always under control.



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ELMIRA, N. Y.

Manufacturers of
INDUSTRIAL CLUTCHES

clutch so that the stud can be driven to any pre-determined torque.

The new "Grasmere" plug gage, manufactured in England relies on three steel balls at the gaging points. This plug gage has a dial indicator mounted at the top, which in operation is above the hand holding the gage in the hole to be tested. It is first inserted into the bore of a ring gage and set. Thereafter diameter, taper, ovality, bell mouth and finish discrepancies are immediately revealed. Two sizes available have a range of $\frac{3}{8}$ " to 1" and 1" to 2".

A set of 3 balls is used in the Eastman Swivel "Snap-Tite" coupler which holds an air hose to the coupler and also allows for swiveling at the same time. The grooved nipple on which the hose and coupler fasten is threaded into a grease gun, spring spray oiler, air hose, paint spray gun, blow gun or any other type of air operated device. A check valve automatically shuts off the air when the tools are disconnected from the hose and forms an integral part of the coupler, thereby eliminating the use of another valve. The balls also allow the coupler and hose to swivel, preventing any tendency of the hose to kink.

The sphere and inclined wedge are the principles upon which the design of the Dodge rolling grip friction clutch is based. It is used in light machinery where small amounts of power are required. There are no toggles. Pressure against the friction disk is developed by a ring of hardened steel balls which are forced into a wedge-shaped groove by a sliding cam. The contours of the cam and groove utilize the basic mechanical principle of the inclined plane to multiply the force exerted on the shifter collar into a much greater force on the friction disk. Two types of clutches, namely the bolted plate type and the gear tooth type are equipped with this means of pressure exertion.

In the Seiss jewel industry, there have recently been developed, balls made of rubies and sapphires to be used as ball bearings and for single ball

PORTER-CABLE *Wet-Belt* SURFACER

"... recommend it to
any Tool or Die Shop..."

E. L. Danielson, Vice-President,
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Chicago, says of the PORTER-
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illustrated at right.

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Shows application and operation of Wet-Belt Surfacers. Loaned FREE for foremen's meetings. Requests welcomed.

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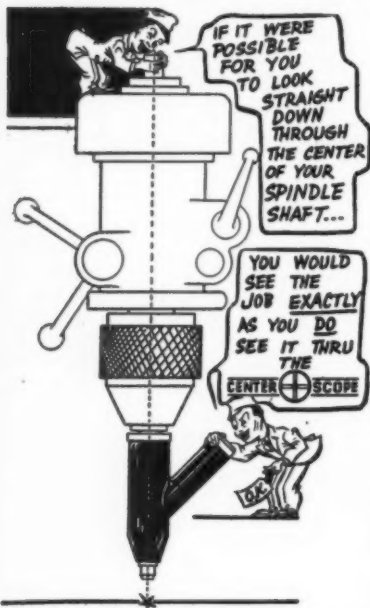
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A NEW LOCATING TOOL

The O. W. Center Scope is an optical centering and locating tool that can be easily used on any machine to center work reference lines to a spindle center line with simplicity, speed and accuracy. Write for further information on this and other Center Scope products.

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end thrust applications. Altho these balls can be made of any suitable precious or semi-precious stones, the sapphire and ruby types of synthetic corundum are generally used. These balls range in sizes from $\frac{1}{4}$ to 2 millimeters in diameter and are made to an accuracy of variation with each other of .0001" or closer if required. Besides being of utmost hardness, these balls possess a high modulus of elasticity. They also have a high degree of non-deformability to resist crushing. They are acid proof, resistant to corrosion and wear, are non-magnetic also. Thermal expansion is exceedingly low. They take a markedly high polish and are said to be capable of being used for long periods of time without need of lubrication.

Balls made of these materials were developed originally for use in non-magnetic bearings for the instrument trade. It is thought that such balls will be used more extensively in various industries before long.

An interesting application of hardened steel balls is that introduced by Lempco Products, Inc., 5729 Dunham Road, Bedford, Ohio, for use in anti-friction guide pins for die sets. This type of guide pin was developed to prevent freezing of the pin in its bearing, especially where exceptionally high speeds of the punch are required. The pin rides in a ball studded cage, in which the balls are staggered around the pin in the form of a helix. After test runs of as high as 18,000,000 strokes were made, it is claimed that .0005" preload remained of the original .0015" preload applied. Therefore it is possible to keep the play or possible clearance between the guide post and the bearing balls to an absolute minimum. Not only is production increased by less down-time for die grinding or sharpening operations, but the die sets can be opened and closed by hand, without resorting to the use of jacks or kindred tools during the set-up period.

The Gear Grinding Machine Co. has several products in which balls play an important part. Announcement has just

FOLLOW THIS GUIDE TO HACKSAW ECONOMY

* The chart at the left gives you the right pitch and, for machine cutting, the right speed for cutting almost any material.

FOR HAND SAWING

Material		Teeth per inch
Aluminum	Solids	14
Angles	Heavy	16
Angles	Light	24
Babbitt		14
Brass	Solids up to 1"	16
Brass Pipe		24
Brass Tubing		24
Bronze	Solids up to 1"	16
BX Cable	Heavy	24
BX Cable	Light	32
Cast Iron	Up to 1"	16
Channels	Heavy	16
Channels	Light	24
Cable	Heavy	16
Copper	Solids up to 1"	14
Drill Rod	Over 1/2"	16
Drill Rod	No. 30 to 1/4"	24
Drill Rod	No. 30 and smaller	32
General Purpose Cutting		16
Iron Pipe		24
Metal Conduit		24
Sheet Metal	Over 16 gage	24
Sheet Metal	Under 16 gage	32
Steels	1/2" to 1"	16
Steels	1/2" and under	24
Tubing	Over 16 gage	24
Tubing	Under 16 gage	32

FOR POWER SAWING

Material to be Cut	Teeth per in.	Strokes per Min.	Weight or Pressure, Lbs.
Aluminum Alloy	4-6	150	60
Aluminum, Pure	4-6	150	60
Brass Castings, Soft	6-10	150	60
Brass Castings, Hard	6-10	115	60
Bronze Castings	6-10	135	125
Cast Iron	6-10	135	125
Copper, Drawn	6-10	135	125
Carbon Tool Steel	6-10	90	125
Cold Rolled Steel	4-6	135	150
Drill Rod	10	90	125
High Speed Steel	6-10	90	125
Machinery Steel	4-6	135	150
Manganese Bronze	6-10	90	60
Malleable Iron	6-10	90	125
Nickel Silver	6-10	60	150
Nickel Steel	6-10	90	150
Pipe, Iron	10-14	135	125
Slate	6-10	90	125
Structural Steel	6-10	135	125
Tubing, Brass	14	135	60
Tubing, Steel	14	135	60

When using "S-M" Molybdenum or High Speed Steel Saws, the same pitch of teeth may be used, but the speed can be increased. Coolant Should Be Used For All Materials Except Cast Iron.

STARRETT HACKSAWS

The list below describes briefly the wide range of Starrett hand and power hacksaws from which you can select the right blade for any job.

FOR HAND SAWING

- Starrett Standard Flexible Back, All Hard or "Semi-Flex" blades cover all ordinary service requirements.
- Starrett "S-M" Molybdenum blades are specially tempered for fast cutting of hard metals at low cost per cut.
- Starrett 18-4-1 Tungsten High Speed Steel blades handle all the hard-to-cut metals.
- Starrett "Safe-Flex" high speed steel blades with flexible back and hard edge are virtually unbreakable however tough the job.

FOR POWER SAWING

- Starrett "S-M" Molybdenum saws have a remarkable record of production performance at low cost per cut.
- Starrett High Speed Steel 18-4-1 Tungsten all hard blades are ideal for light and heavy sawing of high alloy metals, stainless steel, phosphor bronze, tool steels, chrome steel, monel, etc.

Every Starrett Hacksaw is milled, heat treated, tested and inspected to meet Starrett standards of quality and value.

Be sure you use the right Hacksaw for the job. Ask your mill supply distributor for Starrett Hacksaws.

THE L. S. STARRETT CO. • ATHOL • MASS. • U. S. A.
World's Greatest Toolmakers

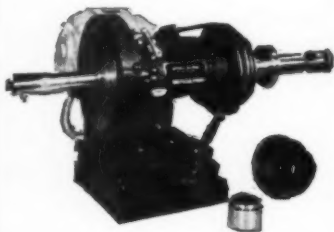
STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

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For those precision
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accurately attached to
face. Calibrated, ec-
centric boring heads.
A proven machine.
Other models for air-
craft and automotive
users. Write for sug-
gestions on your bor-
ing problem.



HYDRO-BORER COMPANY

Division

Southwestern Development Co.

1740 W. 59th St., Los Angeles 44, Calif.

been made of their Ball-flex angular and axial-friction flexible coupling. Torque is transmitted thru a number of hardened steel balls without the use of sliding members or fiber or rubber disks. In this manner flexibility is obtained by mechanical means only. The free rolling movement that the balls impart eliminates side thrust. Misalignments both in angular and in parallelism or a combination of both, are overcome in this style of coupling. A flexible seal which is impervious to oil covers the periphery of the members to retain the lubricant and keep out dust, moisture and other foreign matter.

This same company has for years made the Rzeppa Universal joint in which six hardened steel balls make it possible to provide a high degree of angularity in a constant velocity type of universal joint. Torque is transmitted thru these six balls, operating in a plane that at all times bisects the angle of deflection, whether this angle is low or as high as 35°. This is said to eliminate the vibration usually set up in both driving and driven members by alternating pulsations in the older types of universal joints. Power is transmitted from one shaft to the other by the use of a single joint. Two driving members, separated by a cage to hold the balls, have spherically shaped contact surfaces. These half grooves in the driver and driven members are deep, with but enough clearance for the ball separator.

In the last installment of the series of ball articles, several applications were illustrated of balls being used to overcome friction longitudinally as in a slide. Here the balls were substituted for the square and dovetail guides. Armstrong-Blum Marvel Saws use such an arrangement to obtain high frictionless rigidity for their blade frames. This design consists of two straight line ball races of special design containing large balls. They are adjusted at the factory for rigidity yet for frictionless operation.

Balls made of plastic materials were also discussed in the series. One such

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Cuts Gaging Costs in Half**

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TOUGHNESS — made to stand continuous hard use. No chipping.

NON-CORROSIVE — Rust proof. No rusting in storage or in handling.

NON-MAGNETIC — Will not pick up chips that might injure work.

HANDLES are marked plainly and are easy to grip and use.

TAMPER PROOF — Handles are equipped with a special drift for removing plugs. This drift is kept in Inspection Department where only changes may be made.

REVERSIBLE — This feature gives two "Go's" and two "No Go's" in one gage handle. Either can be reversed when worn and you have an accurate gage.

COLORED PLASTIC COLLETS

Color identifies plug instantly. Weight is reduced. Secure locking — no slipping. No marring or scratching of plugs as with metal collets.

**GREEN
for
"GO"**



**RED
for
"NO GO"**

UNITED PRECISION PRODUCTS
3522 WEST BELMONT AVENUE, CHICAGO 18, ILLINOIS

ball has been observed, being used as a hand grip on a square shaft. The ball is broached with a square hole of approximately $\frac{3}{8}$ " on a side. The diameter of the ball is $1\frac{1}{2}$ ". At one side of the square the ball is sawed with a $1/16$ " wide cut to facilitate fastening to the shaft. A filister screw clamps the ball adjustably in place along the shaft.

A ball bearing screw and nut was also discussed in the preceeding article in which the screw was machined with helical groove or ball races which registered with similarly shaped grooves in

the nut. An endless string or row of balls was placed between these grooves to form a frictionless assembly. It was stated that this application was used originally in the steering mechanism of passenger cars, trucks, and buses; also that such a design is adaptable to machine tool lead screws, lift trucks and overhead conveyors.

In 1937 a patent was assigned to the Packard Motor Car Co., in which the inner and outer members were helically grooved with a row of balls one touch-

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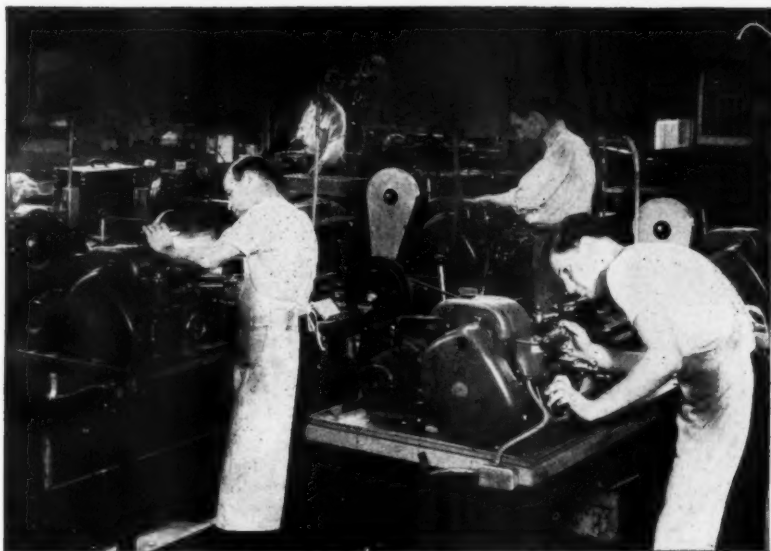


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Check Atlas lathe specifications against your requirements. Swing: $10\frac{1}{2}$ " over bed, $6\frac{5}{8}$ " over carriage, up to 36" between cen-

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Atlas tools can solve many small parts production problems with important reductions in machine-hour costs. Send for latest catalog with complete specifications and operating views.

ATLAS PRESS COMPANY
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4 *Atlas* TOOL TEAM
FOR
SMALL-PARTS MACHINING



LATHES



MILLING MACHINES

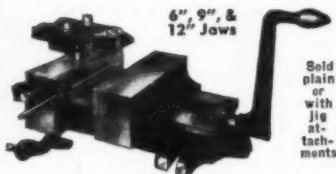


SHAPERS

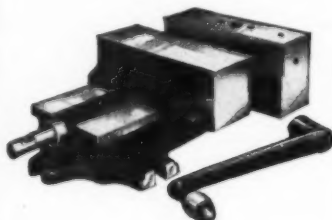


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Request New Illustrated "Bulletin 41"

GRAHAM MFG. CO.
56 Bridge St., East Greenwich, R. I.

ing the other, placed between these helical channels. The unit was adapted to the link mechanism connecting the front steering wheel of a car with the main frame so as to permit vertical movement between the two members. Felt rings retained the balls at each end of the assembly. The inner member acted as a pivot and had a short oscillating movement in the outer member. Thrust was taken along the entire length of the helix, likewise radial load.

Also in 1937 Manning Maxwell and Moore, Inc., was assigned a patent in which 5 rows of balls became the driving media of a motor driven hoist. The center shaft is an extension of the motor shaft and is cut like a worm with helical hemispherically-shaped grooves to fit the contour of the balls. The end caps are so arranged that the five rows of balls pass from the driving member to the outer shell of the hoist. When the motor is running, the shaft screws the balls toward this outer shell so that the latter rotates in the opposite direction at a greatly reduced speed.

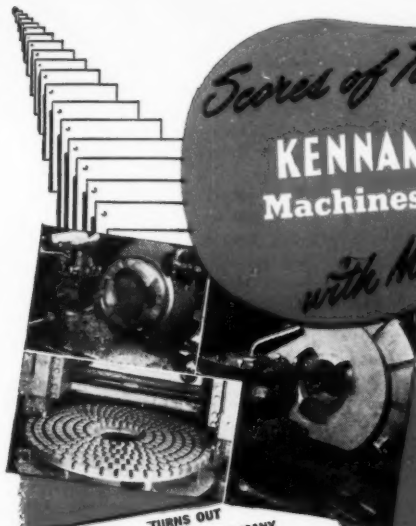
In the design of a press tool for splicing wire in a connector by means of pressure, a patent was granted to the Whitney Metal Tool Co., in 1938. This covers a manually operated tool in which two telescoping members cut with helical grooves with balls between, form a ball bearing screw thread. Continuity of the row of balls into an endless stream is arranged by directing them into a channel in the outer member, thence to the other end of the groove in the inner or screw member. This is done by means of pins having especially shaped ends.

Then in 1939 a patent was assigned to Eclipse Aviation Corp., for an hydraulic aircraft engine starter, in which a ball thread was used. In this starter, a great many turns of the crank are obtained for a short piston travel by use of ball operated screw. It is started with pre-compressed air or by an explosive cartridge. This pressure causes engagement of the ratchet teeth and the ball threads turn the starting shaft as the piston moves ahead. After starting is accomplished, this piston is returned by a large compression spring.

Scores of Tough Jobs Prove

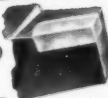
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With Maximum Economy



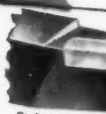
Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.

**Turns out
10 TIMES AS MANY
PIECES, ON ROUGH CASTING,
BETWEEN REGRINDS**



One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inletor grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed—.032". Depth of cut 1/16" to 3/8". SFM-280.

**REMOVES TONS OF
METAL FROM CHILLED
CAST IRON PARTS, AT
TOOL COST OF
74¢ PER TON**



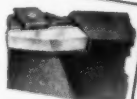
Style 12 Tool with K6 tip turns 1 1/4 lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 2 1/8" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut—1/4". SFM-120.

**CUTS 35 PIECES (on
Abrasive Electric Iron)
AS AGAINST 3 FOR
CARBIDE PREVIOUSLY USED**



This unique tool, tipped with Kennametal K6, turns out 11 1/2 times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.

**MULTIPLIES
OUTPUT, ON FACING
OPERATION, ON
SANDY IRON CASTING**



Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing cut—1/8" to 3/16". SFM—.036". Depth of after tool entered cut.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this new and improved tungsten carbide—Kennametal Grade K6.



KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL INC., LATROBE, PA.

LOOKING AHEAD

By GEO. S. BENSON*

WHAT will John Q. Public pay for what he wants? He will pay every cent he thinks it is worth to him. Ultimately he will be willing to pay more, if he finds out the item is worth more than he first thought. On the other hand he will kick at the price and refuse to pay it as soon as he finds out the thing is worth less to him than the money he paid for it.

These statements are so plain and so simple that any schoolboy is able to understand them. You would think hardly anybody could get these facts mixed-up, but they are often used wrongly. Under them is hid the 1946 labor-management problem which is the most serious and the most dangerous one that has ever confronted this nation. What lies behind all the headlines telling about strikes?

Can't Get Together

In extreme brevity, union laborers are asking their employers for more pay—more wages than the employers (for some reason) are willing to lay out. Why not pay working men whatever they ask? All trades, especially farmers, want laborers to draw high wages because that's the key to good times. Farmers, whose fields feed the workers, have good markets and prosperity when labor prospers.

The answer is not hard: The workers' wages, just like the owner's profits, come out of what John Q. Public will pay for what he wants. If the price is too steep for John, then there's no sale and no profits and presently no wages. If the price is within reasonable range of John's pocketbook, he buys. That makes profits and wages, better jobs and more of them, and prosperity.

High Wages Popular

There is such a thing as oppression;

I have seen it in China. There is such a thing as exploitation of labor—ignorant labor. But it's foolhardy to mistreat workers in a modern American factory. If an employer should try holding wages down to fatten his own bank account, his customers would all favor higher pay for his workers because (in such a case) it could be done without boosting prices.

In most cases, when wages advance, prices have to advance to cover the expense. There is no other way to raise wages except by boosting prices unless the prices already in force are fictitious, unfair figures, which competition seldom permits. Customers object to wage increases only when they call for price increases to cover them. Even then, Mr. Public is not always right.

Who Can Say When?

Many a wage increase is appropriate and economically sound even when prices have to be raised immediately to cover them. Lifting prices to pay better wages is good business, up to a point. But what point? Up to the point that John Q. Public gets slow about buying. So long as volume can stay large, the price is sound. When volume drops off and prices have to be boosted to pay for the blunder, that's unsound.

There are experts in every business who can estimate with remarkable accuracy how many of this-or-that will sell for some stipulated price. They know long before the first one is made. This year, when steady jobs at good pay are so vital to everybody, prices should be set in advance to get volume sales. Labor, as well as industry, should be interested in the right prices.

*President, Harding College,
Searcy, Ark.

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4-JAW INDEPENDENT LATHE CHUCKS

Hardened steel reversible jaws, accurately ground, have wide gripping surface. Body is semi-steel, heavily ribbed, and will stand up under unusual strain. The screws are oversize, made of tough nickel steel, have accurately cut square threads. Steel thrust bearings assure durability.

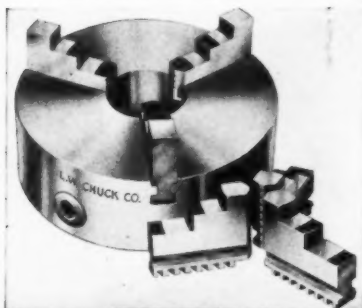
10" Size	\$33.45
12" Size	38.30
14" Size	43.45
16" Size	55.60
18" Size	73.60



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for light or heavy duty work. Guaranteed to run true. Accurately fitted, hardened and ground male and female reversible jaws. Rugged, semi-steel cast body. Accurately cut high grade steel geared scroll and pinions.

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7 1/2" size	\$55.00
10 1/2" size	\$75.00



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UNIVERSAL CHUCKS



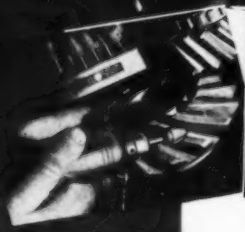
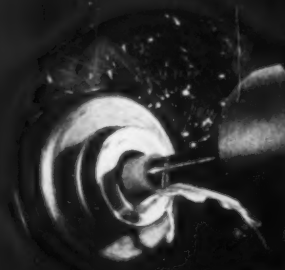
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AND MOUNTED WHEELS**

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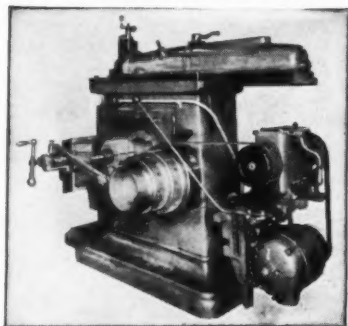
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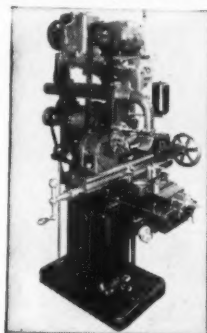
LINE SHAFT LIMITATIONS
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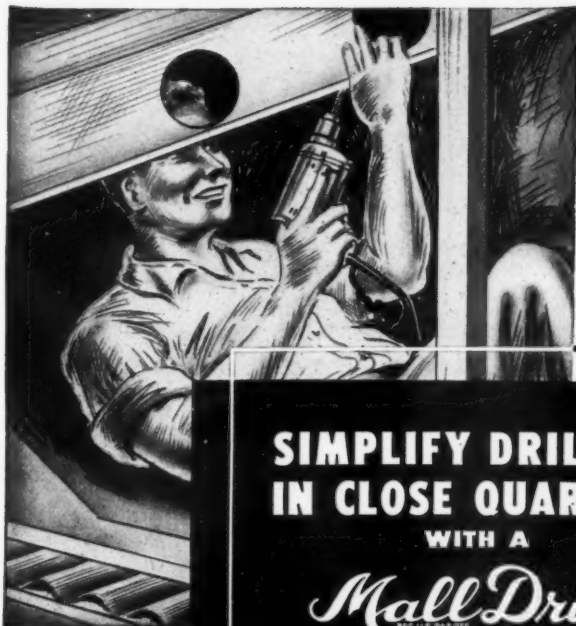
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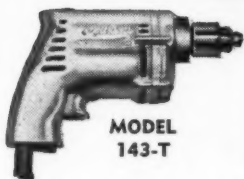




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MODEL
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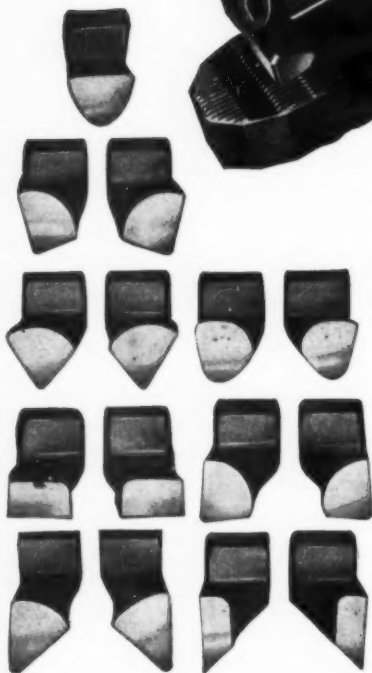
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OK Tool Holders and Bits are available for all machine tools on the market, in sizes and shapes to handle all single point metal cutting. The Holders are made of alloy steel, heat treated for maximum strength and toughness—will give years of service. The bits, or cutting units, are of drop-forged, best selected High Speed Steel, heat treated for maximum performance. Cast alloy and carbide-tipped bits are also supplied.

In the OK Tool Holder, the bit is securely held in a serrated seat by a patented locking device. This design permits sidewise bit adjustment, which assures full, economic use of all cutting units. A single OK Tool Holder, with a set of bits, will replace many of your solid tools and do your work at higher feed cuts and speeds. And with it goes the advice of our Engineering Department and Sales Engineers.

INSERATED-BLADE METAL CUTTING
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CONTOUR FORMING

CONTOUR Forming is the name given to the process of reforming metal sections, received in straight lines or prior curves, into varied other shapes.

Basically this is a very old art. The village blacksmith pioneered and blacksmiths of one kind and another still carry on in fields that machinery cannot reach. The majority of this work is done on power presses and bulldozers in the broad fields of modern metal forming.

Contour forming is a later, rather specialized step in which considerable progress was made under the forced draft of war needs. Contour Forming will create shapes not feasible by single or multiple press action, and offers certain economies in manufacture.

One of the earliest applications was in the forming of domestic refrigerator outer cases, making the curved crowns and forming the corners and sides out of one sheet of metal, previously formed by rolls or presses into the desired cross section, having flanges turned up front and back to which were attached the rear panels and the front insulating strips.

The problem involved in this case was how to form the crown, both from front to back and from right to left without causing work wrinkles either in the channels on the front and back or in the top due to the metal movement, or on the reflection of these movements into waves in the side panels. A quite considerable movement of metal actually takes place. For instance, in a certain refrigerator shell the flange members were compressed in their inner edges in a 90° movement, some $\frac{3}{4}$ " in length, while at the same

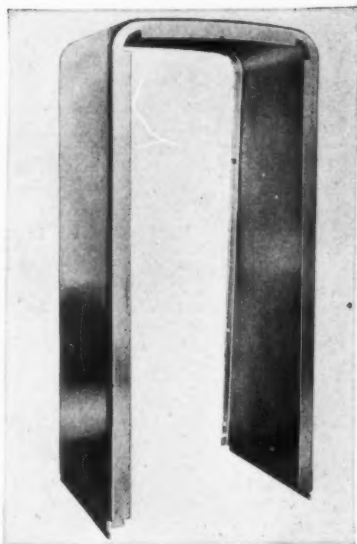


Fig. 1—Seven years ago, domestic refrigerator cases were an early example of contour formed work.

time the outer case in the center line was being stretched $\frac{3}{4}$ " in the center. This typical operation involves a close control of the material during the process of forming. Any wrinkles or deformation, even some not apparent to the eye, show up when high lighted by painting, and completely spoil the job. It is of first importance in this work to produce duplicate parts and almost equally important that the parts be free from work marks, either in the case of domestic refrigerators because of appearance, or more vitally in the case of aluminum or steel alloys because such work marks may become sources

of weakness where the material is used under stress. But, in either case, the elimination of hand finish is of the utmost importance from a cost standpoint. (See Fig. 1)

Early machines made for this work were called Tangent Benders and modifications of these tools are well adapted to making washing machines or deep freeze unit cabinets in one piece, and rectangular shapes of all sorts. A round form in mild steel can still be more simply rolled. (See Fig. 2)

With the outbreak of war these peacetime tools were laid aside and new problems tackled, principally in the airplane field. Here in the fuselage and wings was a happy hunting ground for those in search of complex sections woven into compound curves. The aluminum extrusion process has presented the aircraft designer with an economical means of obtaining almost any kind of cross sections that his fertile mind might devise. These he proceeded to wrap into such shapes as the progress of his art might dictate.

In the shop, however, persuading these complex sections to follow com-

pound curves, often in different planes, was not always "duck soup." To help out, many machines were devised, including the Universal Contour Former. This tool tackled the job of, not alone taking a constant sectional element into curved shapes which had to be held very accurately where necessary, but changing the cross sections during the bending process.

As for instance, in the attach angles which are the members by which the wing tips of an airplane are bolted to the center section in many constructions, and the center section to the fuselage. These may be received in the shop as simple right angle extrusions, but because of the angle at which the wing is joined to the body, this angle must be continuously varied so that one leg of the angle presents a flat surface for bolting while the other follows the curve and angle of the skin and other parts to which it is attached.

Furthermore, such bends must be very accurate to avoid bolt and rivet strain. Similar conditions prevail all over the plane, as for instance, in door frames, in tank straps and a number of other parts like tank straps, outer wing

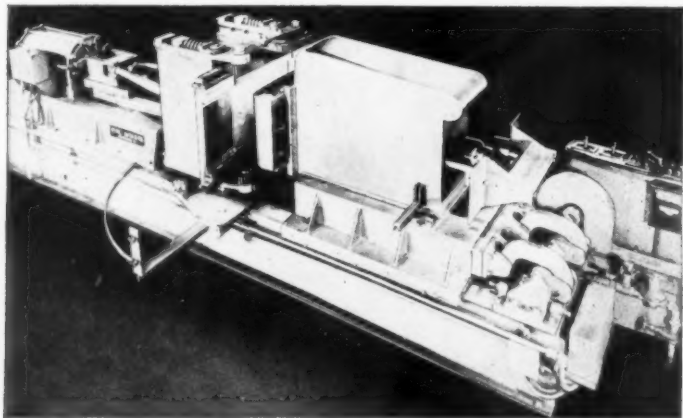


Fig. 2—Early forms of contour formers were called Tangent Benders.

Fig. 3—The Universal Contour Former developed for war finds many applications in peace.



panel, attach angles, wing tip splice angles, stabilizer tips, wing tips, canopy frames, fuselage funnel members, gun turret rings and inner wing formers.

Similar problems have occurred in some rather difficult forms required, for instance, in jet propulsion engines where the interior is stainless steel.

In general, the principal differences

in this class of work as compared with domestic refrigerator jobs previously mentioned, are so considerable it was necessary to develop altogether different machinery. (See Figures 3 and 4—Universal Contour Formers).

In the first place it was found that aluminum, like stainless steel, can in most cases only be formed with the accuracy required by stretching.

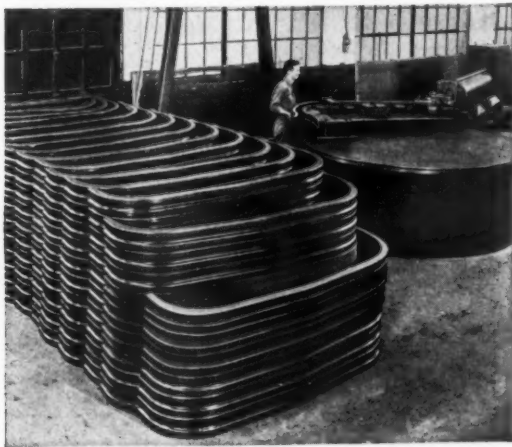
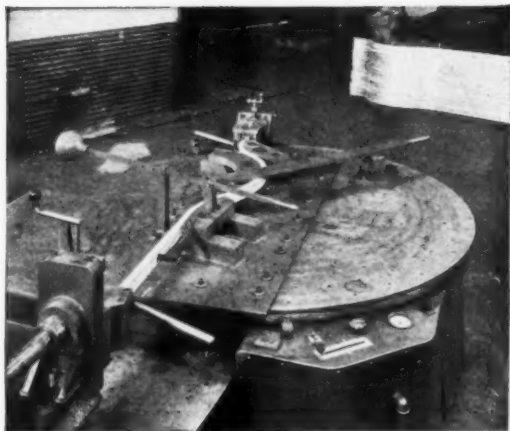


Fig. 4—The Contour Former is busily turning out automotive bumpers.

Fig. 5—A reverse channel bend as run on the Universal Contour Former. Metal is stretched into position. The table reverses in the process.



What was learned about Contour Forming for wartime equipment has proved useful in working out civilian applications, and particularly in trans-

port equipment where the lighter alloys are being widely adapted, because, of course, anything that reduces vehicle weight reduces wheel loads, tire wear



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and power consumption, whether on roads or steel rails.

In the roof carlines and side posts of railroad cars and coaches, in window frames, and in both the cases of the airplane parts, as already mentioned, and allied products, such as wheelhouse angles, roof rails, floor angles, motor supports, main frames, weather guards, bumpers, frame stringers, windshield mouldings, simplified fenders, inner frieze and card mouldings, bumper supports, aluminum, monel, stainless and carbon steel rings of all sections and designs, drip mouldings, decorative trim and bands and stainless turbine jet rings to mention a few, being made in both stainless steel and aluminum and in some cases in carbon steel. The rapid and accurate forming of complex cross sections into this wide variety of shapes is proving its economy in action. Not alone is it possible to produce accurate parts, but also to distribute strains more evenly and from a cost standpoint, the virtual elimination of hand work is of first importance.

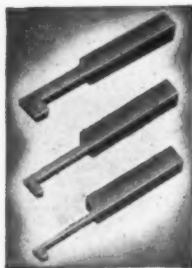
A Parts Division is operated in the Cyril Bath Cleveland Plant which makes parts for others, either to demonstrate the process or because the user does not have sufficient work to warrant the installation of expensive machinery. In this department there is no provision for hand working, nor are there any hand working tools.

It has been found from experience that work tends to divide into two classes:

First, that which can be done by Stretching, and

Second, that which is best Compress Formed.

The latter process involves either wiping, rolling, or forming with tangent bending bars. Some work, as in long difficult hollows shape forming like rectangular tubes, requires a combination of both methods. As machine designers, therefore, the Bath Co., has aimed at producing a machine that could be readily adapted to either

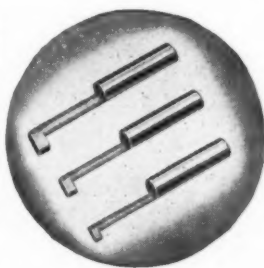


STAR BORING TOOLS

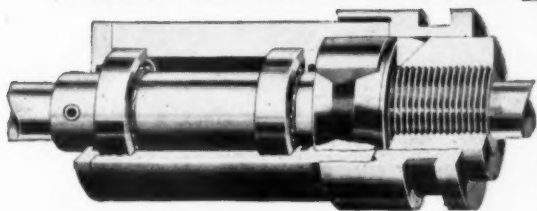
The STAR HIGH SPEED BORING BITS are precision centrifugally cast. This process assures very fine grain structure and increased tensile strength. The high Tungsten content together with Chrome and Vanadium hardened to 64 Rockwell impart to these tools a high red hardness, excellent plus impact value and remarkable compressive strength. Use of these bits eliminates the necessity of hand-grinding tool bits for boring purposes. Hardened two-piece bushings can be furnished for all round shank boring tools in sizes $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or 1" O.D. by $\frac{1}{4}$, $\frac{5}{16}$ or $\frac{3}{8}$ " I.D., at 75c each. Write for Literature.

Shank Size	Square Shank Numbers	Round Shank Numbers	Overall Length	Bar Length	Cutting Bit Width	Price Each
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1/4"	20	25	2-5/8"	1"	5/16"	1.25
1/4"	30	35	2-5/8"	1"	3/8"	1.25
5/16"	70	75	2-5/8"	1"	3/16"	1.25
5/16"	80	85	2-5/8"	1"	5/16"	1.25
5/16"	90	95	2-5/8"	1"	3/8"	1.25
3/8"	100	105	3"	1-1/4"	3/16"	1.75
3/8"	110	115	3"	1-1/4"	5/16"	1.75
3/8"	120	125	3"	1-1/4"	3/8"	1.75

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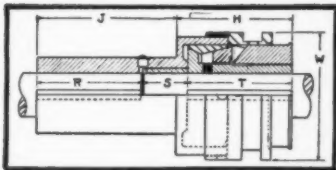
a **HANSON** *clutch* **HAS SOMETHING TOO!**



This type M is but one of HANSON'S many industrial type, dependable friction clutches.

It is entirely cylindrical, perfectly balanced and has practically no speed limitations. Its few moving parts may be easily replaced when worn. It can be adjusted to absolute uniformity by any unskilled workman. A single adjusting nut does the trick.

Type M comes in both single and double units. Install them now. Then you'll see why we say that "A HANSON Clutch HAS something!"



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process. It was also found that many forms ran into complete circles or even spiral members, but these could not be formed in rolls either because of their shape, or in the case of stainless steel or aluminum alloys because spring back made duplication very difficult. Therefore, they aimed at a machine which could make shapes in complete circles or spirals and anything up to that point, including straight lines or reverse bends, or bends in several planes. (See Fig. 5 showing channel being bent).

With this tool many parts were produced as whole pieces, which had previously been built and designed in small sections by reason of limitations in equipment available. Much economy in weight as well as in labor and material is possible by further application of this principle and the product designer is not alone relieved of some irritating limitations, but has opportunity to take better advantage of extrusions and the handsome, lighter and tougher steels.

However, the contour process is not limited to any one field, or to the relatively newer metals. Thus rub rails are made for trailers, as shown in Fig. 3, of tough alloys such as used in car and bus bumpers. Bumpers are made too and they have the advantage of one-piece construction which protects both the front and sides around the fenders as shown in Fig. 4, and, indeed, if anyone should so wish, a one-piece bumper could be made to go all around the car and it might also serve as the base frame piece, if the designer wished.

Today important parts are being bent for most bus, coach, trailer and street car builders.

In developing machinery for this work it was necessary to bear in mind also the cost of dies and setup because much material is formed in small quantities. As a rule, if parts are going to run only a hundred pieces or so, it is cheaper to form them by hand if this is possible because dies cost money


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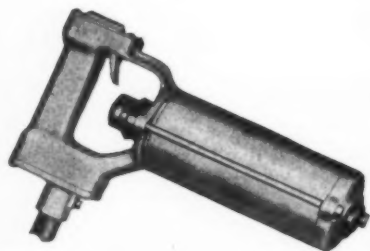
both to design and to build, and every new bend is a real problem all to itself. In fact, one of the real limitations of Contour Forming is in getting men with imagination and technical ability enough to take advantage of the opportunities which the process offers. Actually, where the Bath Co. furnishes equipment, all that's provided is a "Potter's Wheel," as it were, and it is still pretty much up to the potter to make it produce. This is true of the engine lathe also, and like the engine lathe the Contour Former is essentially a jobbing tool—an all-around-tool, but if work is to be produced in quantity by this method, other applications of the principle are available. Generally speaking, parts which can be produced at the rate of 10 or 15 an hour may be made at the rate of one or two a minute on a specialized machine.

Such machinery the Bath Co. makes. It is semi-standard. Not even the Tangent Bender, built since 1938 for the production of domestic refrigerator



Fig. 6—Hat steel section produced by pressure-forming on contour machine. In a piece that was only 36" long, the inside of the metal in the radius was shortened by 5-1/8" and the outside stretched 6-7/8".

cases will make every design of case, but this method is in use by most manufacturers, and new machines are now being made for the newer models. Machines are in process for making rectangular washing machine tubs,



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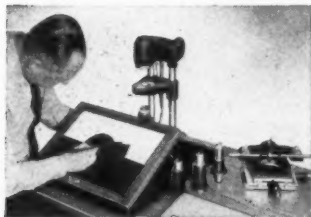
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deepfreeze cases, food cases, as well as for high production of bumpers and similar parts in the heavier field.

Contour forms involve several more or less definite classifications, and on the general character of the work depends the method used.

As the experience goes, contour forming work comes under several general headings, and each piece is its own problem. The first consideration is—what is the material? Second is, is it to be stretch-formed, or compression-formed? If it is a high alloy material, it is almost invariably a stretch operation because this material will not form reliably by compression methods.

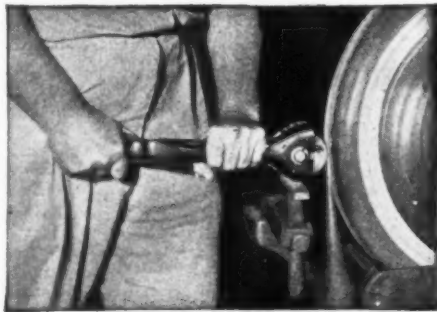
Third, if the piece is 1020 Steel or low alloy aluminum or stainless, it might be compression-formed. This, indeed, may be desirable because of prior punched holes which generally preclude stretch forming.

Fourth, if it is to be compression-formed shall it be a roll or wipe or

tangent bend? In general, if the piece has a severe curvature, compression working may give just as constant results as stretching. Tooling is likely to cost somewhat less. In long shallow bends, however, even in the soft materials, stretch-forming gives constant product because tonnage applied may be varied to offset variations in material behavior. (Even steel will vary from one mill to the other, and aluminum extrusions vary very much more than steel). Heavier members tend to hold shape better but on the whole in tonnage, the work comes about 40% compression and 50% stretch and 10% make use of both processes on one piece either simultaneously or serially.

Fifth, comes the consideration that the specified materials frequently do not have elongation characteristics sufficient to stand the required forms by stretching, but must be compression-formed, or compressed and stretched at the same time. In the latter process, metal in the inner radius of the part is compressed or foreshortened, while at the same time metal at the outer

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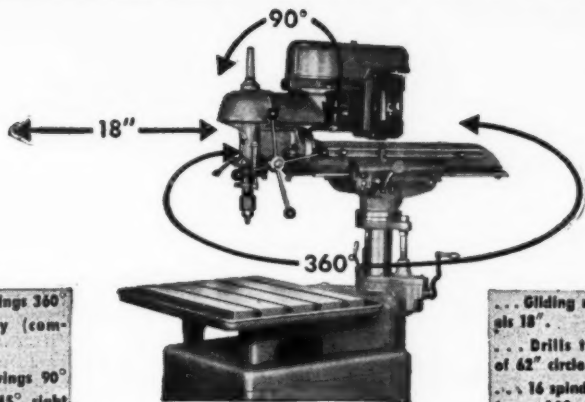
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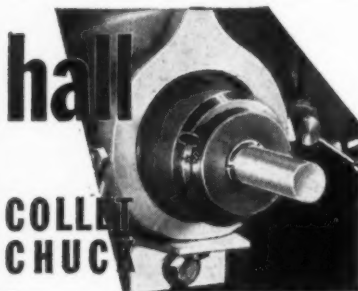
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Fig. 7—Wheelhouse angle formed into two planes by stretching.



areas is stretched. A typical hat section 36" long, shown in Fig. 6, when formed as shown was compressed in the inner

surface $5\frac{1}{8}$ ", while the outer flange was stretched $6\frac{1}{8}$ " at the same time, all without wrinkles or work marks.



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Sixth, if the part to be formed is a hollow section, this involves one of several processes dependent on the material being worked, the severity of the contour and the tolerance limits. As in all other work, close tolerances cost more time, better tooling and involve higher cost, but can be held to very close tolerances, if required.

Seventh, if the piece to be made requires contours in two planes, as in Fig. 7, it is necessary to move up or down the pulling head and to clamp the job after the tonnage load has passed a given point of the section. Often this involves stopping and starting a machine several times to complete the work and is one of the hardest bends to make.

Eighth, some work has contours in two planes at right angles. In this case two separate operations are indicated.

Ninth, Some work has reverse bends in the same plane and involves bending in one direction, and when this is past,

dropping into place a section of the die and reversing the table. Shown in Fig. 5 is a piece in which this was done twice, producing four bends in a channel at one pass. There is no other way by which this can be done because high alloy aluminums will not form in bulldozers or by dies, spring back being very indeterminate and the shape almost impossible to achieve in this manner.

Tenth, Some work, as in channel sections, bent with the legs up can only be accomplished with a laminated metal mandrel in place and involves a mandrel unloading cost, but by one means or another the job can be successfully done and many parts are made in this way.

Contour Forming offers many interesting economies and considerable opportunity for improvement in appearances. It will not generally compete with press type operations where these can be successfully performed.

(Illustrations and data — Courtesy The Cyril Bath Co., Cleveland, O.)

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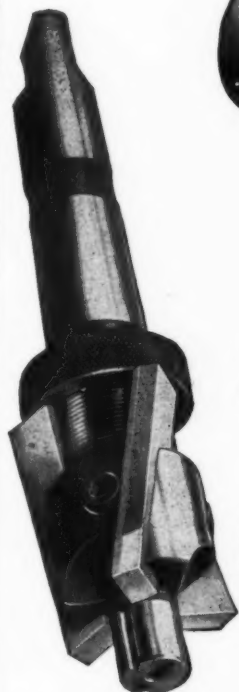
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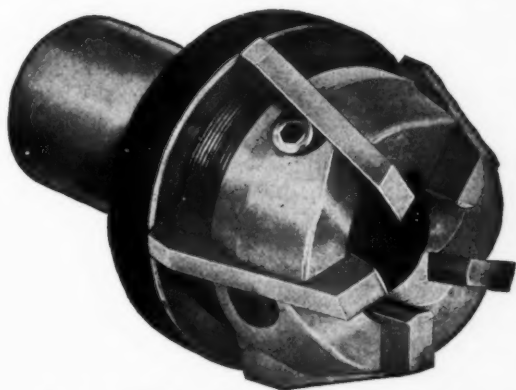
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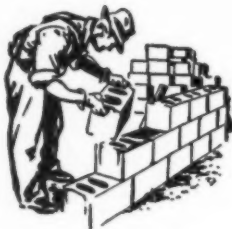
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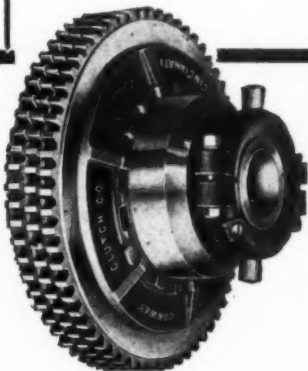
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The plane flew from Long Beach, Cal., to LaGuardia Field, New York, in four hours, 13 minutes, and 26 seconds, averaging 584 miles an hour on the trip and at times reaching speeds in excess of 600 mph.

One of the chief features in the all-welded construction engine, besides the lightweight metals used, is the extremely favorable hp weight ratio of better than two hp per pound, as compared with one per pound in reciprocating type engines.

There are more than 500 welded joints in the engine, and in making them, practically every known type of weld-

ing was utilized, each one in applications where its particular advantages could best be employed. For example:—the circular seam welding of a flange to the outer exhaust cone is done by resistance seam welding, and many parts in the exhaust unit assembly itself, where pressure tight welds are not required, are spot welded.

Since intense heat of the combustion creates very high operating temperatures (about 1500 F), heat-resistant alloys are required for the combustion chamber and the exhaust unit. In order to keep weight of the engine down, these heat resistant alloys were used in sheet form, some as light as 0.022" in thickness.

These austenitic stainless alloys give high strength and good corrosion resistance at high temperature. By welding these parts the engineer was able to design for minimum weight with maximum joint efficiency, both in thermal strength and physical strength.

Fig. 1—Placing combustion tubes in fixture tubes for aircraft gas turbine.



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Fabrication of various parts out of sheet metal, however, led to one of the real production problems and it was only thru the closest co-operation on the part of design engineers, manufacturing department and welding engineers that the correct procedure for making parts was finally established.

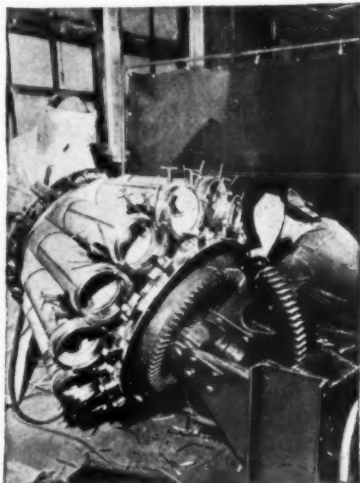
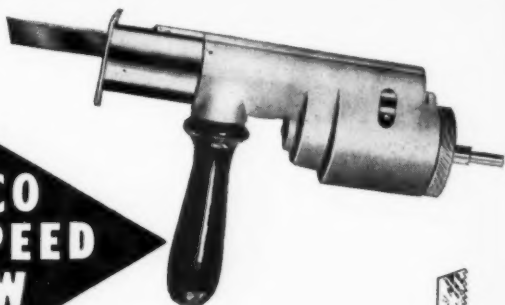


Fig. 2—Welding cross-over tubes to flame tubes by the atomic hydrogen process.

The fabrication included joint design, fixturing, welding process and machining procedure. In considering joint design, it was first necessary to design for strength. Then weight, distortion, and gas flow were closely checked. For example, a joint where it was necessary to join pieces of different thicknesses, it was known that minimum weight would be obtained by using a straight butt joint. A joint of this type, however, would set up a stress concentration in the thinner piece and encourage failure in service. Fusion welding of this joint would also cause greater distortion. Therefore, where the flanges were welded to the exhaust casing or the ring holders as well as to the flame

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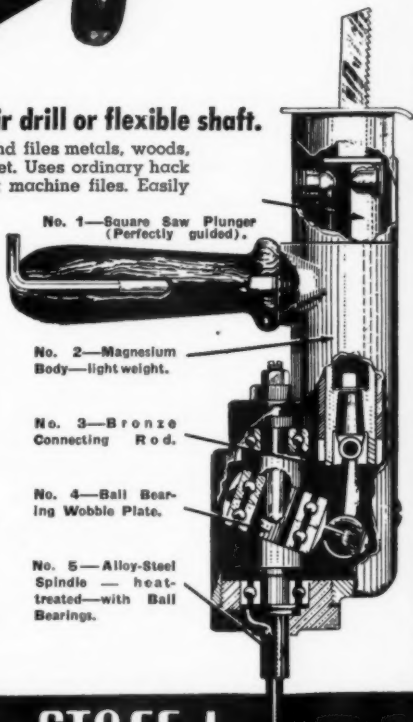


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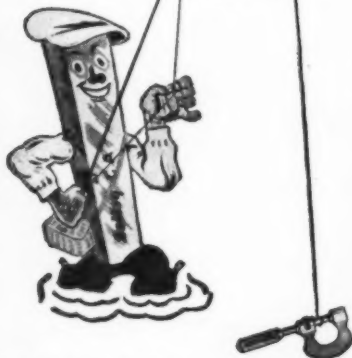
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tubes, a lap joint was used and the weld was generally made by resistance seam welding. This joint proved tight, had excellent strength, a minimum of distortion, and a neat appearance.



Fig. 3—Circumferential seam welding of large flange to cone assembly.

In cases where there was great variation in thickness, it was possible that fatigue failure would occur in the thinner section, next to the lap. Because of this, it was desirable to keep both pieces as nearly alike in thickness as possible. The longitudinal seams, in some instances, were designed for a flush joint without the necessity of grinding. These were made by clamping the joint in a fixture and backing it with hydrogen, and then welding it by the atomic-hydrogen process. The hydrogen backing was provided by burning hydrogen in a groove milled in the backing bar of the fixture. On the thicknesses up to 1/16", it was proved possible to butt the edges up square, and, using the fixture as mentioned, weld the seam without the addition of filler or the use of flux. This resulted in a nearly flush joint



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that did not require cleaning and had excellent physical strength. The use of filler was eliminated by clamping both sides of the joint tightly within $\frac{1}{4}$ " of the joint. Bringing heat of the arc to the metal expanded it and forced it to hump at the joints. This hump was melted down, giving a flush weld. As the metal cooled, a little elongation occurred between the clamps, but this was so slight that it had little effect upon the strength of the joint. In some cases where a fillet weld was necessary between sheet stock and a heavier section, the metal arc welding process was used to advantage.

It is axiomatic that distortion caused by welding, especially in sheet metal parts, is practically unavoidable. In order to make use of the advantages of these parts, allowance had to be made for this distortion wherever possible. When this allowance could not be made, however, it was possible to reduce the distortion by using proper fixtures and sequence. In some cases, welding sequence can be used to reduce distortion and machining sequence to correct it.

By careful planning of operations in manufacturing the Type I-40 engine, it was possible to solve these problems and to make parts according to the manufacturing drawings, in spite of the many problems encountered in welding on sheet metal.


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By FRANCIS A. WESTBROOK, M.E.

DEVELOPMENT of the flame-planer for the preparation of the edges of steel plate for Unionmelt welding was a direct result of the tremendous increase of production in shipbuilding and other heavy steel construction. For welded construction it is essential that the edges of the plate be properly prepared in contours having from one to three surfaces, and it was necessary to design equipment to provide for a speed in this connection consistent with the speed of welding the seams. Such speeds were not obtainable with the previously machining operations.

Accurate cutting of the edges and butt joint welding was so far preferable to the making of lap joints that it was required for virtually all construction of ships, tanks, and other work involving the joining together of large

quantities of plate by welding. Means other than machine tool planing were needed and it was only natural to turn to flame-cutting which provided the advantages of:

- (1) High speed production.
- (2) Availability of equipment.
- (3) Low cost of equipment.
- (4) Low power consumption.
- (5) Low investment charges on equipment (major operating charges are for labor, gases and power used only during production.

Until recently, most of the flame preparation of plate edges was done either with the manual cutting blow-pipe or by means of one or more blow-

Fig. 1—In this set-up, three cutting nozzles traveling along edge of plate produce in one pass, the double bevel and unbeveled root face.

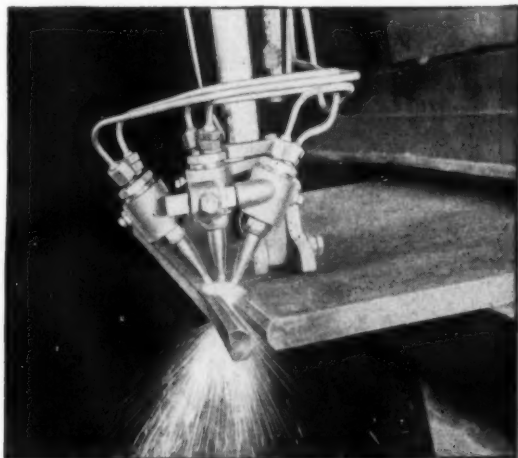


Fig. 2—A cutting machine of this type permits side stepping heavy equipment yet provides for accurate cutting.



pipes mounted on small motor-driven carriages operating on portable tracks, or traveling on the plate itself. Of course, the cutting flame imposes no load or strain whatever on the plate, as does a machine-driven cutting tool. For this reason there is no need of providing heavy clamps to hold the work in place. Heavily constructed equipment

is not called for, nor is there any great amount of power consumed in the operations.

While many of the early types of flame-cutting machines carrying single blowpipes are still satisfactorily cutting single beveled edges, or straight square edges, a more economical type is now

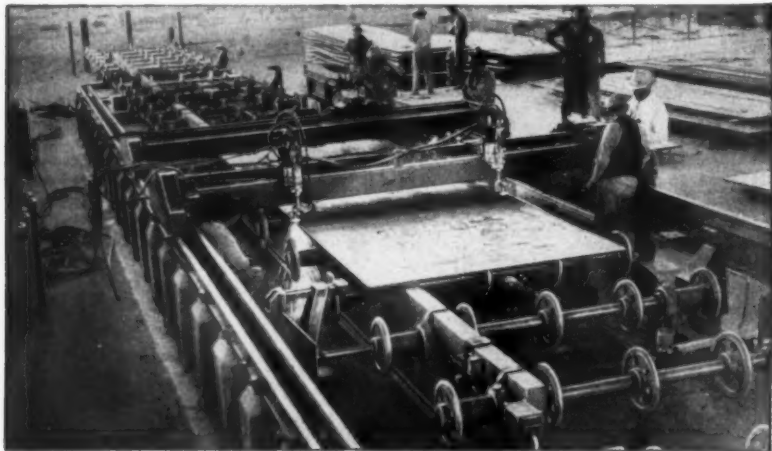


Fig. 3—This equipment provides for the mechanical handling of ship plates by means of live rolls, reducing crane handling to a minimum.

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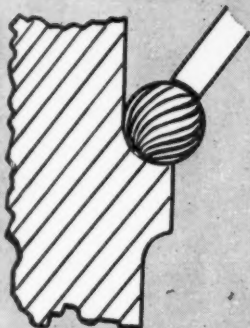
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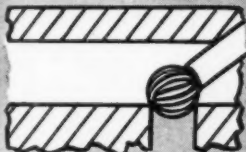
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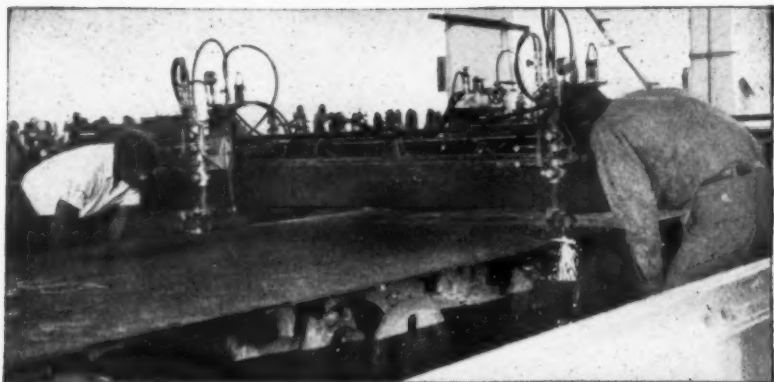


Fig. 4—The middle bridge with its two carriages and flame cutting nozzles travels along the track to make long cuts.

employed for flame-cutting the more complicated edges. Where a double bevel, for instance, is required, it is necessary to make two passes with the single blowpipe machine, and it would

be necessary to change the setting. Where the edge must be prepared with three surfaces, as with the double bevel and unbeveled root face, three passes and three adjustments must be made.

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1 1/2" O. D.	1/4-20	1/4-28	5/16-18	5/16-24	3/8-16	3/8-24	7/16-14	7/16-20		\$6.75	\$5.51	\$4.61	\$3.95
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1 1/2-13	1/2-20	9/16-12	9/16-18	5/8-11	5/8-16	3/4-10	3/4-16						
SIZES										1	2	3-5	
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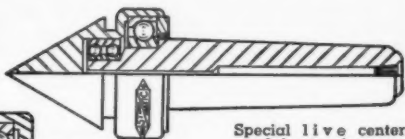
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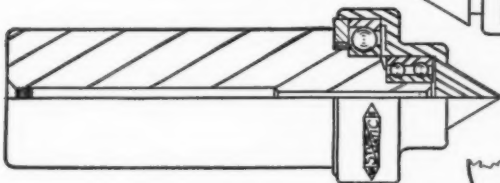
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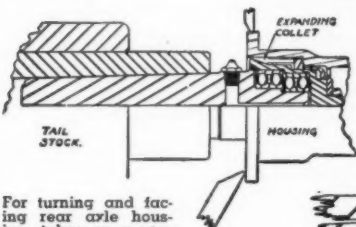
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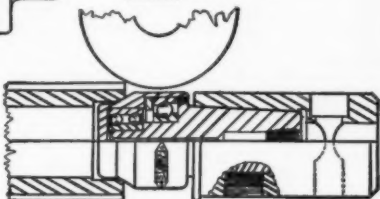
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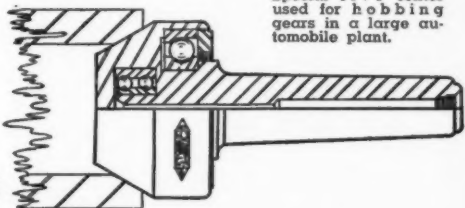


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Obviously the ideal way for speeding up production is to flame-cut such surfaces in one pass and to prepare all four edges of a rectangular plate simultaneously. This is exactly what was accomplished by the flame-planer built by the Link-Belt Co., in conformity with the ideas and requirements of The Linde Air Products Co.

Assuming the most complicated edge prepared for welding in actual practice, that with the double bevel and unbeveled root face, the cuts can be made in one pass by three cutting nozzles arranged as shown in Fig. 1, held in a fixture that travels along the edge of the plate to be prepared. To make the edges of the bevels uniform and parallel with the plate surface, the nozzles must always be at a uniform distance from the surface of the plate. If the blowpipes are rigidly attached to a carriage which travels on a straight track, it is essential that the plate be held perfectly flat in order to realize these conditions. This would require the heavy equipment which it is desirable to avoid.

A very simple way to side-step heavy equipment and still provide for accurate cutting is with a cutting machine of the type shown in Fig. 2. This consists of a carriage that travels on tracks, with the blowpipe and nozzle assembly supported on a vertical shaft free to move up and down. The floating assembly rests on a small wheel which rides on the plate to be prepared. As the carriage moves along the track, the nozzles remain in uniform relation to the plate accurately following any waves in the plate. The only thing that is necessary is accurate track alignment and sufficiently firm foundations for maintaining a rigid mounting. However, as no great loads are involved, suitable foundations can be provided easily.

For quality plate-edge preparation, as in shipyards, the mechanical arrangement that best met the requirements was that shown in Fig. 3. It provided for the mechanical handling of the plates by means of live rolls and reduced crane handling to a minimum. The conveying table is divided into

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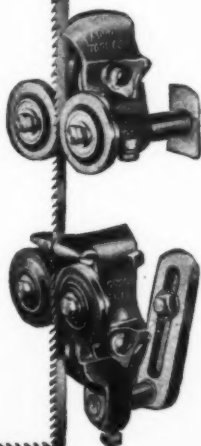
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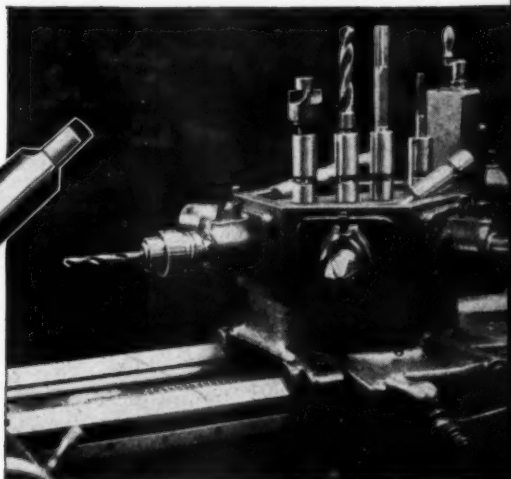
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three sections, each with a set of motor-driven live rolls, each separately controlled by means of pushbuttons. A crane is used to place the plate on the first set of rolls and from here the plate is moved to the next section where the flame-cutting takes place. At the cutting section, there are automatic squaring arms for aligning the plate and holding it in position. When the cutting operation has been completed the plate is passed along to the third set of rolls whence it is removed by crane.

Fig. 3 also shows a view of the cutting units of the plate flame-planer. Accurately located rails are provided on each side of the cutting section of the roll table and on these rails travel the three bridges carrying the flame-cutting units. The cutting units consist of carriages substantially similar to those already described. Two of these cut the ends of the plate (only one of these is shown in Fig. 3) while the two carriages on the center bridge cut the sides of the plate, all operating simultaneously. The two bridges for cutting the ends remain stationary while the carriages travel along them to make the cut. But the middle bridge, Fig. 4, with its two carriages and the assembly of flame-cutting nozzles, travels along the track to make the long cuts. This middle bridge is operated by a variable speed motor so that adjustments in the travel may be made easily. The end bridges are not motor-driven as it is only necessary to move them for comparatively short distances to position them. Any of the cutting units can be

equipped with nozzle blocks having one, two or three nozzles, according to the particular requirements of each edge. Blocks can be changed quickly and easily. All the adjustments may be made quickly so that plates of different dimensions can be run thru the "planer" with a minimum consumption of time. On these machines, plates from 5/16" to 1" thick, and up to 8 ft wide by 40 ft long can be handled.

It should be noted that the time required for edge preparation of a plate by means of the flame-planer is determined by the time required to make the two simultaneous longitudinal cuts. This is because the end cuts are shorter and take less time. The saving in time made possible by use of the flame-planer is obvious, as is the fact that the speed of plate-edge preparation is consistent with the speed of fabrication resulting from welding.

(Photographs, courtesy The Linde Air Products Co.).

FLAT BROACH SHARPENER

Great Lakes Broach & Gage Co., 1008 Franklin St., Detroit 8, Mich., offer a new Flat Broach Sharpener and Back-off Machine designed to take care of all requirements in the efficient, economical and fast servicing of flat broaches.

The machine will handle practically all Flat Broaches, Insets, Keyways and Broach Bar Assemblies. A particular feature is the handle for the table feed, graduated to .0005", thus enabling operator to re-step and back-off Keyways and other similar broaches without employing a surface grinder.

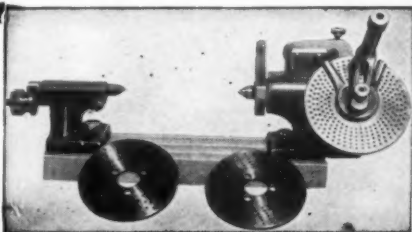
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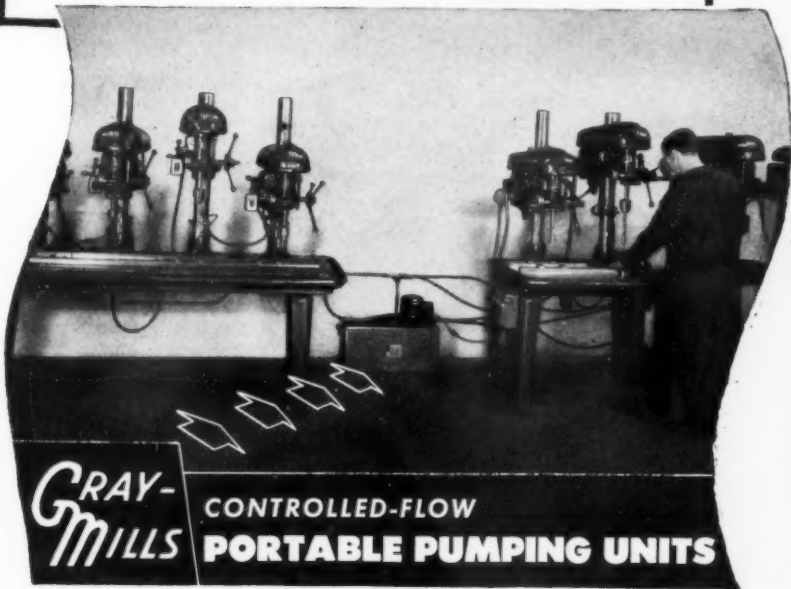
6" swing. Overall length 63 1/2". Base 3 1/4 x 2 x 3". Spindle has No. 7 B & S taper and take-up collar for end thrust. Threaded spindle nose 1 1/2" dia., 12 threads U.S.S. Plates cover entire range of B & S chart. Worm wheel ratio 40:1. Complete with 3 dividing plates, 4" dia., one 24-notch indexing plate and tailstock.

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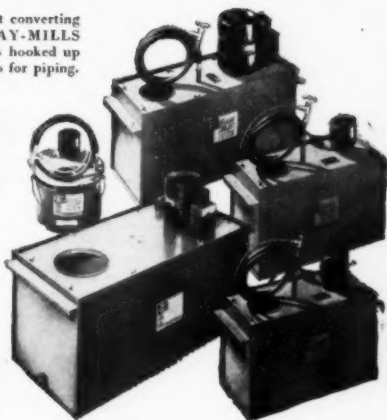
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Rack Designs for Spindle Sleeves

By H. F. WILLIAMS

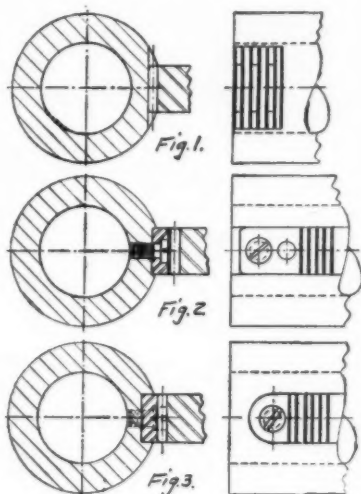
IN numerous types of machines, spindles must be advanced either horizontally or vertically by means of rack and pinion operated sleeves. Unless the spindle housing sleeve is made of alloy steel, or at any rate unless the teeth are heat treated and possibly ground to shape, the designer and shop man is faced with a sometimes vexing question:—How should the rack be attached or should the teeth be cut directly into the periphery of the sleeve?

If the loads are considerable and the sections thin, whether of cast iron or mild steel, teeth cut into the sleeve as in Fig. 1 are not always satisfactory. Here the sleeve is first flattened to approximately the width of the engaging gear or pinion so that the maximum tooth engagement is available. When the teeth are of a larger pitch, the teeth have been cut directly on the rounded surface where the maximum depth of tooth falls on the centerline only. This might be sufficient for light duty but it is hardly satisfactory for general machine work. Of course, the sole advantage of the foregoing method is that the center-distance between the axes of the spindle and the operating pinion can be held to a minimum, a requirement that sometimes dictates such a design of rack and sleeve.

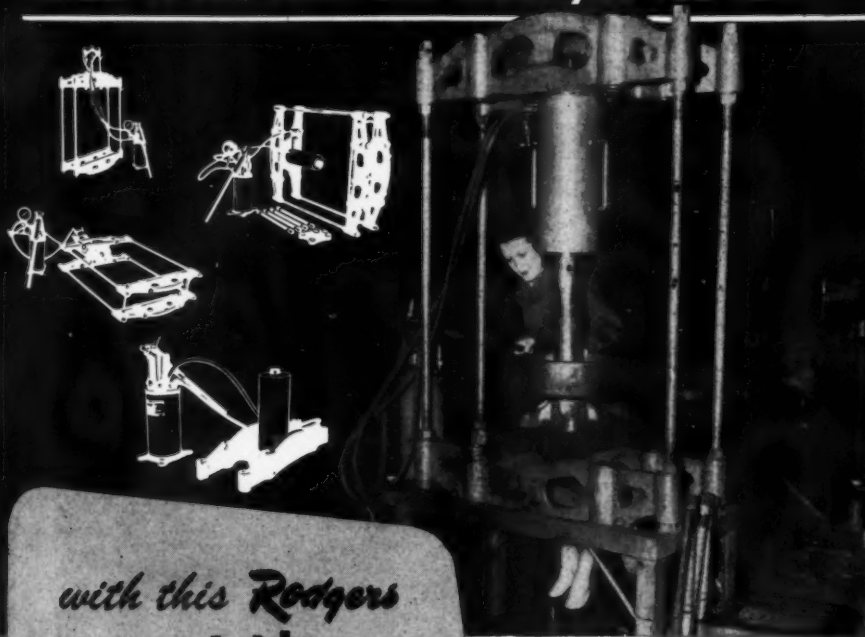
Assuming that the spindle sleeves in the remaining drawings are made of cast iron, the designs are such that steel racks are fastened by various means to the sleeves. These racks can be made of mild steel or steel having a low carbon content. They may be left soft or heat treated by carburization, or further, they may be of hardened alloy

steel with the teeth ground to exact shape.

In Fig. 2, a shallow slot is cut into the periphery of the sleeve for its entire length. This slot is necessarily shallow so that enough metal remains beneath it for sufficient thread-hold for the screws. In this design, the rack is not quite so long as the sleeve so as not to interfere with any contacting member at either end. The ends of the rack which accommodate the screws and pin are thinned so that the upper surface is beneath the root of the tooth. The screw head is necessarily thin as shown. Because of the looseness of the screw in the screw hole, a dowel pin must be used



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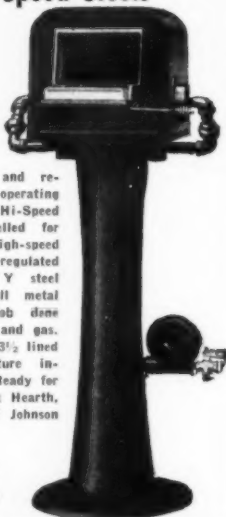


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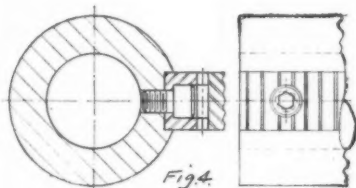
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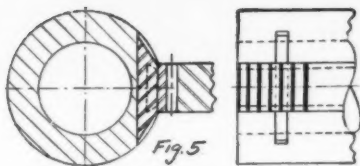
State

to take thrust. The feature of this design is that the length of travel is greater because the teeth of the pinion have clearance over the relieved ends of the rack.

Whereas an over-and-over cutter is used for cutting the rack slot in Fig. 2, an end mill or spline milling cutter is necessary for the slot in Fig. 3. In this design the rack is fitted like a round ended key or spline, in that the lengths of rack and slot are of the same dimension. This overcomes the necessity of using a dowel pin to take the thrust. The ends of the rack are not relieved, but the heads of the screws are flush with the tops of the rack teeth. While in Fig. 2, the low wall heights of the slot are augmented by a rather long screw thread, the design shown in Fig. 3 is somewhat different. Here the rack is assembled with a press fit. Not only does the rack fit snugly endwise but on the sides as well. Because of this additional friction and for the fact that the side walls of the slot are considerably deeper, only about four threads of the screw are considered necessary for contact. The two screws are also retained by thin lock washers at the bottom of the counterbored holes.



In Fig. 4, a somewhat heavier spindle sleeve rack and pinion are used. To obtain the maximum amount of pinion travel, the counterbored holes for the screws are machined into tooth slots. The counterbore is of such depth that the pinion teeth clear the screw head. Here the pinion can be fed practically to the end of the rack, even tho only half a tooth length is available where the three screw heads are.



An ingenious way of fastening a rack in a spindle sleeve having all the good features of the foregoing examples was first used a number of years ago by a prominent manufacturer of drilling machines. The bottom of the rack was dovetailed and slid into a similarly shaped groove in the sleeve. The key fitted snugly in both members and was ample for any end thrust imposed upon it. The ends of the key were cut at an angle so as not to interfere with the proper sliding of the sleeve.

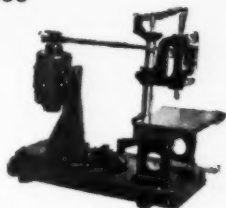
MORELAND COUNTERBORE

A 20-page catalog that illustrates and includes specifications of a new counterbore and special high speed steel cutting tools has been released by the Moreland Tool Co., 16935 W. McNichols Rd., Detroit, Mich.

The eccentric principle is utilized in the design to equalize completely the torque load on the holder and the mating driving member of the cutter . . . both shank of cutter and corresponding hole in the holder being round in shape and eccentric in location only. Concentricity of the assembled unit is held to close precision tolerances by means of a "stick taper". The angular notch is so positioned, as to assure a full contact of the driving members from the start, which also functions as a mechanical check against careless assembly of holder and cutter.

The pilot has no other function than as a guide—cutter can be drifted from the holder without disturbing its location. The pilot extends back the full length of the flutes, where it is enlarged to provide for inserting a brass nut for holding pilot in place. A brass nut being strong enough for the normal purpose of a pilot but at times when the guiding hole is undersized and the pilot binds, the thread of brass will tend to strip before there has been any cutter damage. The length of pilot permits sharpening away more than 2/3 of the cutter without affecting either the drift-out features of the cutter or concentricity of pilot.

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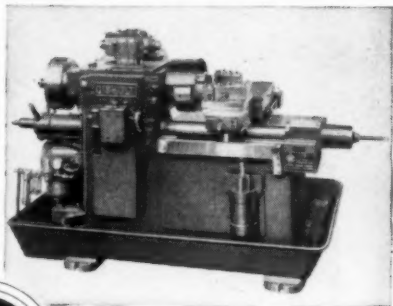
The Gisholt Hydraulic Automatic Lathe

We deliberately put this piece "in the works" of this machine to see if we could make it jam. But it was just a gag. Frankly, we *knew* it wouldn't!

But this illustrates one of the interesting features of the Gisholt Hydraulic Automatic Lathe. It positively refuses to operate if *anything* goes wrong. Immediately, it trips into turn traverse and backs out of trouble. The spindle stops. No damage can occur.

This simple, foolproof operation of the Gisholt Hydraulic Automatic Lathe will save you time and trouble in many ways—for many years to come. With moving parts reduced to a minimum and running in their own oil, wear and maintenance are almost negligible.

These are only plus values. The primary value of this modern automatic lathe lies in its high productivity—its ability to duplicate performance accurately on all parts—faster, at lower cost. Ask for all the facts about it.



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BUDGETING POST-WAR OPERATIONS

By ARTHUR ROBERTS

IT is axiomatic that a plan is essential to maximum efficiency. Even such a variable as the weather is charted for human guidance by meteorologists; the government operates on a budget; home builders have their blueprints and dance routines in a musical comedy are not left to chance. Many other activities are planned beforehand. In business, such planning is called budgeting. A budget does not assure success but it is mighty helpful toward that goal. It is the blueprint used in building business.

Among machine tool users, however, planning is too seldom part of the business curriculum. Business movement for a forthcoming period is left largely to chance. The main objection to planning is that business is unpredictable, but this does not hold in view of the success that business planners have experienced with this work.

Since the income tax hit the stratosphere, businessmen who have failed to budget operations with the income tax included, have been disillusioned at their pocket-profit after the Federal toll was computed. To minimize this hazard, the machine tool user should budget and get some perspective of the net less the tax beforehand. Maybe he will not hit the result on the button, but if he adjusts estimated against actual figures month-to-month, including the tenta-

tive tax up-to-date, he should have a much better idea of the result than if he operates without benefit of budgetary control. Of course, there will be differences between estimated and actual results, but this does not negate the value of a budget as a valuable check-sheet on operations.

All budgets require a certain degree of flexibility and the figures set at the beginning of a period may be changed if conditions warrant it. The budget should be set up for each month and checked monthly. A budget may be started any month and usually covers one fiscal year. If a business year ends in December and a management starts budgeting in May, estimates should be forecast until December and then budgeted from January to December thereafter, the budgets being kept in a looseleaf binder for comparative analysis so that a management can determine the accuracy of estimates from period-to-period. At first, estimates may vary widely from actual results, but with the passing months, and close application to the figures, the management will find itself doing a better job of forecasting.

Some businessmen contend that their business is so complex in certain phases that budgeting is impossible, but this idea does not square with the experiences of businessmen in general. Many



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industrialists producing hundreds of different products budget their operations and find it helpful. The biggest weakness in the production and distribution of goods and service, particularly in small and moderately-sized organizations, is the omission of budgetary preparation from the business curriculum. Negligence along these lines in this postwar period will prove more costly than in prewar years because the income tax was much lower then. Today, this tax is a big expense burden on operation, and because of its progressive feature, it increases with profitable volume. The businessman must plan income and outgo beforehand to get some perspective of his spendable income after the tax is deducted at the end of the year. The fact that, because of many variables and uncertainties, operations will be hard to forecast in this postwar period, is no excuse for not budgeting, altho most businessmen decry the efficacy of a budget for this reason, contending that they do not know what the morrow will bring, so how can they budget for an extended future period. Such businessmen fail to understand the underlying reason for a budget. Its purpose is to provide a jumping-off place from which to get perspective on future business movement. Even tho the going may be rough and unpredictable, a compass is essential to a mariner; in fact, it is needed more in turbulence than in calm.

The machine tool user should remember, however, that budgeting has undergone a basic change since prewar years. Then sales were the basis of calculation. The budget-maker looked over his past sales, then estimated future volume, usually figuring high as a stimulant to his selling organization. Next he estimated the cost of sales, otherwise, labor and materials, then budgeted overhead, fixed and variable, to arrive at his estimated net profit. Because the war has distorted prewar ratios; because conditions today are unstable and will bring into being entirely different ratios than the accepted yardsticks of prewar years; because many new products will come to market feeling their way for consumer acceptance; because

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there is a tremendous pent-up demand for all kinds of goods and service at prices that are anybody's guess, it would be unwise to try to appraise sales volume for a forthcoming period on the same basis as prewar years. The budget-maker must use a different plan. He must set up his budget in reverse. In other words, he must estimate his costs and expense, inclusive of tax, add net profit, then the mark-up or margin experienced for a prior period, arriving at his sales volume last. In setting up his costs, the machine tool user should use prior period figures as his base, adjusting them in line with future plans. If he plans to increase advertising or selling expense, he increases this outlay. If he plans to buy certain depreciable assets, he includes a depreciation charge for them. On the other hand, if he plans to discard certain depreciable assets, he reduces wear-and-tear expense accordingly, and so on. Every sensible businessman has a fairly good idea of what he intends doing along these lines over a forthcoming period so he adjusts prior figures on costs and overhead expense accordingly. If expansion or modernization are on the agenda of postwar operation, these outlays should be considered altho they will not be figured on the operating statement but indirectly such outlays affect operations. If a machine tool user binds himself to the payment of installments on postwar modernization or expansion, he may cripple his working capital, pass discounts or find that he cannot pay his bills,, which may be as harmful to profitable operation as low-volume sales or high-ratio costs. Hence, he must consider these monetary factors when budgeting. Business today is getting more and more complicated. It is far more complex than in prewar years, which makes it necessary to plan every phase of it and not operate hit-or-miss as too many did in prewar days. This applies to users of machine tools, large and small. They all have a lot of things to watch, a great many hazards in the mists of postwar operation.

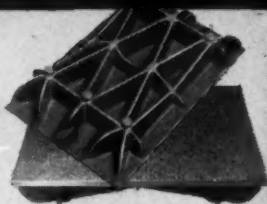
Based upon costs, overhead expense and net profit, the budget-maker will arrive at a sales volume figure that

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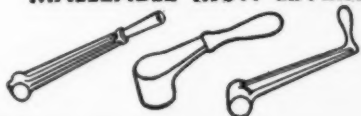
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should prove profitable, and, of course, income taxation must be taken into consideration. However, this is a volume figure for the whole year or period under forecast and it must be broken down to monthly totals to be of value. Sales volume varies during a year in accordance with consumer buying habits, seasonal business, production output and selling efficiency, most of which may be approximated by analyzing past experience figures, then setting monthly quotas accordingly. For example, if January sales for a prior year, or the average for a number of years, showed 3.5 per cent of total sales, then the current budget is set up accordingly and so on for every month in the year. Suppose that prior period figures showed these monthly ratios on sales:

January	\$10,500	3.5%
February	9,600	3.2
March	15,000	5.0
April	18,300	6.1
May	28,500	9.5
June	31,800	10.6
July	30,000	10.0
August	34,200	11.4
September	34,500	11.5
October	39,000	13.0
November	27,600	9.2
December	21,000	7.0
Total	\$300,000	100.0%

The budget-maker would use these same ratios in computing monthly sales for a forthcoming period, regardless of whether he budgeted volume at more than \$300,000 or less.

In checking over our research work sheets covering prewar operations of machine tool users, I find that 90 per cent using budgets made or exceeded anticipated net profits; 10 per cent dropped below anticipated net profits, by an average of only 8 per cent; none lost money. Of those not using budgets, only 30 per cent made or exceeded anticipated net profits; 45 per cent did not make the net profit hoped for, the deficiency averaging 22 per cent; 25 per cent lost money, even though they used a pricing formula that worked out profitably on paper. It is only reasonable to conclude from these field studies that budgetary control in prewar days was essential to the attainment of maximum profits. Certainly, if this business control was needed in a more calm atmosphere, how much more imperative is it in this postwar period, when business is being needled by labor unrest, higher costs, peacetime restrictions and high taxation? The wise machine tool user will defend his business security with a postwar budget—and also keep close tabs on taxes.



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Let's Talk Shop

COMPENSATING ELEMENTS AND DEVICES

IN the machine field, the designer frequently encounters various types of problems that can be satisfactorily solved only by the application of some kind of compensating device. It is interesting to note some of the things that have been done along this line, remembering there is a high degree of probability that they will be applicable in some way to problems encountered in the future.

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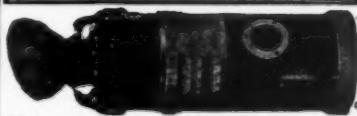
CONANT TOOL & ENGINEERING CO.

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Compensating weights have been used in various ways, but one of the most interesting I have seen was the application of a compensating weight to parts being dynamically balanced in a machine designed for the purpose. This machine was intended especially for the balancing of long parts, such as relatively long crankshafts, that required a center support while revolving, as well as supports at the ends. One end of the member was balanced at a time in this machine. At the driven end, where the part being balanced was connected by flexible coupling to a drive head and an arbor, the arbor carried a weight holder in which the compensating weight was held, and in which it might be moved to a point where it would correct what unbalance was present.

Space forbids going into a full description of the machine. When the part to be balanced was set in motion, a rotating indicator traveled the circle of a dial on the front of the machine, and

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the presence of unbalance would cause electric sparks to jump from the indicator to a graduated metal circle at the outer edge of the dial. Facilities were provided in the machine for first swiveling the weight-holder on its revolving arbor until the weight assumed a position in the same angular plane as the unbalance in the part proper, and then for moving the weight in that plane and in the weight holder until it came to a position where it effected a true compensation or counterbalance for the unbalance in the part, at which time the sparking on the dial mentioned ceased.

Position of the weight could then be checked, after the machine was stopped, with the help of auxiliary devices provided. You will see at once that the angular position of the weight, relative to the part being balanced, would locate the angular position of the mass causing the unbalance, which would be directly opposite. You will also understand that the radial position of the weight, with reference to the distance it was removed from the center of rotation, would indicate the amount of the unbalance. There were graduations on the compensating weight-holder, by means of which the amount of unbalance, as expressed in ounce-inches, could be readily determined.

What would you do in the case of a high-precision screw-cutting lathe, to compensate for small errors inevitably present in the lead screw? The way in which this was handled, in the case of a high precision lathe made in Switzerland, but marketed by a firm in this country, was to attach an arm to the leadscrew nut, and extend that arm to a curved slot in a plate mounted at the front of the machine. The arm, governed by the curve in the slot, serves to impart a slight rotation to the nut in one direction or the other, thus slightly retarding or slightly accelerating so as to keep the action of the cutting tool absolutely constant. The curvature of the slot is of course determined by means of accurate measurements taken of the errors in the lead screw. Further, the plate containing the slot can be rotated about an axis, to compensate for variations in room tem-

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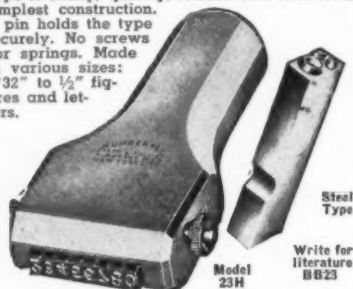
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temperatures between 32 and 68°F.

Have you ever considered the machining of various types of rings, as for instance gear rings, that are fairly large in diameter and of sufficiently small cross-section to be easily distorted, and wondered how you would hold the rings in their rough state without distorting them, at the lathe, while the first cut, whether inside or outside, was being taken? In order to do this, it is necessary to have a considerable number of chucking jaws, so that the ring may be supported at nearly every point, and with only a very moderate pressure. Air-powered chucks having special jaws of compensating type have been developed in some instances for the handling of such work, very often a double-contact-point jaw being swiveled from a point in the body of the chuck, so that the various contact points may accommodate themselves somewhat to the initial irregularities in the rings, until the first cut has been taken. Undoubtedly most of our specialists in the production of pneumatic chucks could design equipment of compensating type for jobs of this kind.

Compensation for wear in bearings is a proposition that has been very thoroughly solved in cases where tapered roller bearings of certain types are used, but did you know that with reference to end play that builds up as the result of wear between bearings and flanges, bearings and collars, or other parts, devices have been perfected for making compensation for such wear automatically? The basis of the solution to this was the interposition between the bearing and the adjacent thrust bearing surface of a compensating device in the nature of an automatic expanding element, which expands as the need may arise, to take undue play out of the mechanism. It has about the appearance of a spacing washer, but is really made up of two cams which, when rotated upon one another in opposing directions, will expand in cross section. The expanding action takes place periodically or in increments. If the compensator is adjusted to take up wear in increments of .001", and a given amount of leeway has been predetermined to take care of expansion and contraction of the parts due to temperature

changes, then there will be no expansion of the device until the wear has reached the point where it is .001" greater than the amount held for clearance. At that time, an expansion of .001" will take place thru the action of a contained power spring which acts to rotate the parts one upon the other. The spring is continually acting to cause this rotation and expansion, but it cannot do so until there is sufficient wear or clearance for an internal gage pin to pass one of a series of ribs provided for the purpose. When the pin slips past one of the ribs, revolution and expansion occur until the pin encounters the next rib, where it abides until another .001" of wear has taken place, regardless of the passage of time or other conditions. This is a very clever device, and one that tends to make things considerably more easy for the designer.

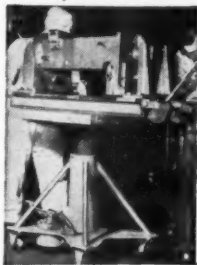
Even in the case of production machine vises, we occasionally find some sort of compensating element. In cases where material of soft or relatively fragile nature is being worked, or parts that by their nature are highly susceptible to distortion or other damage if too great pressure be applied, it is certainly well worth while to use a vise in which the jaw pressure may be adjusted to suit the work. One vise not only has such a provision, but it also has a compensating feature in the nature of a special toggle-linkage layout which will insure uniform pressure regardless of differences in thickness of the parts being clamped in the vise. Spoilage losses have been greatly reduced in many cases by the use of such a device.

Springs as compensating devices. It is hard to say in how many places and in how many ways springs have been used to compensate in one way or another. A very interesting application of spring compensation was in the case of modern universal floating chuck or toolholder for horizontal operation. It is one thing to use a floating toolholder in a vertical position, but it is quite another to employ one in a turret lathe or in an automatic screw machine, for drilling, counterboring, reaming, etc. How to compensate for the weight of the tool is the question. The way in which it was done by one maker of such a

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chuck was to provide adjustable spring pressure for the purpose.

There are countless other aspects of compensation in machine design and machine building. These, taken at random, however, cover a very considerable cross-section of mechanical effort, and will undoubtedly be useful in stimulating thought along this line, both toward the development of further devices, and toward the greater utilization of those we already have at hand.

By JOHN E. HYLER

EYE SAFETY

In the interest of reducing eye accidents, which are one of industry's great safety problems, Willson Products, Inc., Reading, Pa., has developed a new and novel program which appeals to both novel educational program which appeals to both workers and employers.

Posters are available to all plants that desire them for bulletin board use. These safety posters sell eye protection to workers on a personal benefit basis. Colorful and compelling Kodachrome pictures made by some of the nation's foremost photographers show the joys of life which only a man with full sight can know. Contrasted is a large patch of black nothingness. When the ordinary man goes to a ball game he sees action. The blind man sees nothing.

"Industry frequently overlooks the fact that eye accident costs which average \$2,150 each, and are the costliest industrial mischance, are among the easiest to prevent," Thomas A. Wilson, Company President, said in revealing the new program for greater eye safety had been launched after exhaustive research into the psychological attitudes involved.

Goggles in a worker's pocket don't protect him from flying chips. Shields lying on a work bench never prevented a welder from an eye injury. Yet the same machinist who keeps safety goggles in his pocket while he grinds a tool wouldn't think of driving an automobile which didn't have adequate brakes.

PLANT LOADING CHART

A chart showing the safe loadings of plant industrial trucks has decreased accidents and improved truck maintenance at the South Philadelphia Works of Westinghouse.

Previously, several trucks were out of service and accidents were occurring due to overloading, improper loading, and handling of materials. Repair parts

were difficult to obtain and it became necessary to purchase additional equipment to compensate for the excessive time the jitneys and trucks were spending in the repair shop.

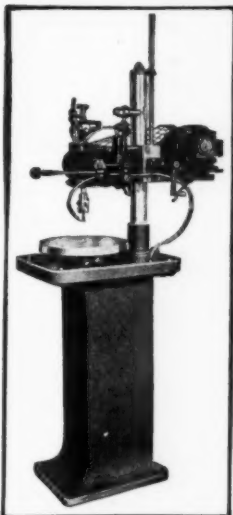
A study of the problem indicated that many of the jitneys and trucks were being overloaded, material was not stacked or piled properly, and accidents were happening which, fortunately, had not seriously injured anyone, altho re-machining was required to repair damaged items.

It was frequently difficult to determine the proper method of loading and the safe loads which could be hauled. This problem was given detailed study and resulted in the development of a loading chart which shows the proper types of transportation equipment, the proper loads of material which can be handled easily, and the proper types of blocks or skids required for safe handling the loads during transportation. Since it was obviously impossible to cover the thousands of parts which are manufactured, representative items were chosen to give a reasonable distribution of sizes and shapes without including special items for which skids and holding fixtures were provided before moving could be ordered.

By showing the representative items for a series of similar sizes and shapes, each item shown furnishes the correct answer to a considerable number of similar parts, particularly since the identification is given, a picture of the part is given, and the total weight indicated. The large numbers indicate the quantity that can be handled for each type of transportation facility, and the transportation facilities on which these parts should not be transported are also indicated. By making a general disposition of this chart to all supervisors, safety men, transportation department employees and crane hookers-on, transportation in the shop has been much improved from the standpoint of eliminating arguments and discussions during loading and transportation of material. Where questions arise they can be answered quickly to the satisfaction of all concerned by reference to the chart posted on the side of the jitney. Safety men can verify proper loading and blocking of equipment being moved by jitney or truck thru their departments, and proper types of trucks can be ordered by the hooker-on for making the moves required. In addition to this, repairs on transportation equipment have been reduced, hazards to other employees have been practically eliminated, and damage to finished parts seldom occurs.

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in 90
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Tapping speeds are 95 to 350 rpm with reverse speed twice that of forward speed. Taps are guided by precision ground lead screws which are easily and quickly changed. Bulletin 143 gives full details.

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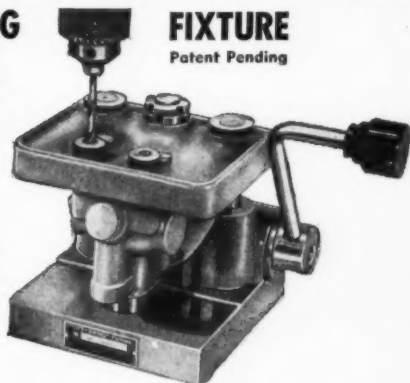
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(Top can be swung one side as illustrated below.)

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Much faster operation — much easier operation and a much greater range and variety of jobs per size fixture. Extra top plates can be purchased easily and quickly installed.



After drilling, top can be quickly swung one side and without removing piece from fixture, you can body drill, chamfer, counter-bore or tap.

WHAT A SAVING OF TIME as well as a greater degree of accuracy and alignment of the finished hole.

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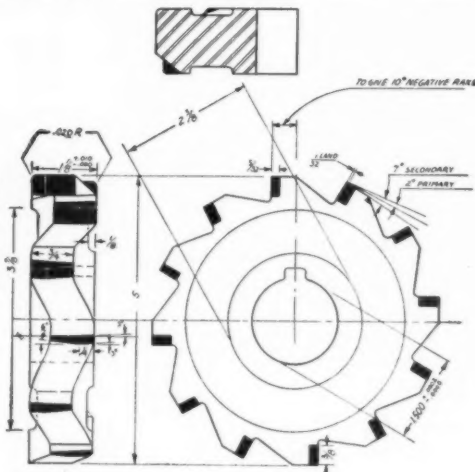
CLIMB-MILLING

The use of climb-milling in conjunction with a heavy flywheel is reported to have materially simplified the milling of very hard welded steel in one shop. A Carboloy cemented carbide tipped staggered tooth milling cutter is employed on this operation, and a high production rate of parts milled is being maintained.

actually being cut—is Rockwell C-50, or approximately Brinell 495.

Climb-milling technique is employed, with a 150 pound flywheel on the spindle to steady and smooth out the cutting operation as in fly-milling. Construction of the 12 bladed cutter is shown in the accompanying sketch. The cutter is tipped with Carboloy grade 78B, a cemented

Climb-milling with this 12-bladed, Carboloy cemented carbide tipped staggered tooth cutter, in conjunction with a 150 pound flywheel, has made it possible to mill extremely hard welded steel at high production rates.



Courtesy of Carboloy Co

The operation consists of milling a weld line 12" long in a welded steel receiver body for a 20 mm gun. A cutting speed of 300 sfpm (229 rpm) is used; a feed of .006" per tooth (16½" per minute table travel) is maintained; the maximum depth of cut is 1/16"; and an air blast is used as a coolant. The hardness of the steel adjacent to the weld—that is, of the metal

carbide combining toughness with good wear resistance and widely used for the general machining of steels.

Despite the fact that no annealing is performed on the welded parts before milling, and that the extremely hard steel is being cut at high speed, an average of 70 pieces are being satisfactorily milled between cutter regrinds.

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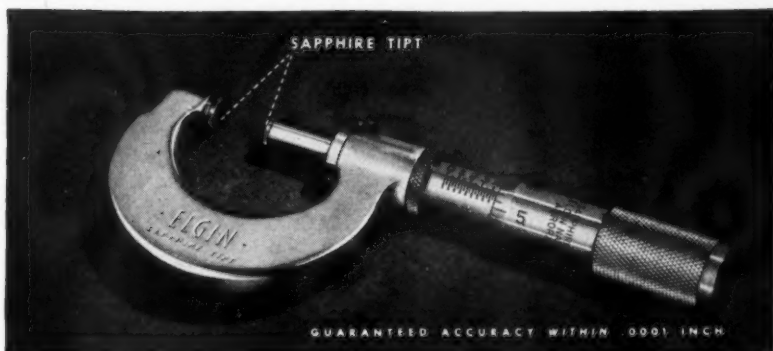
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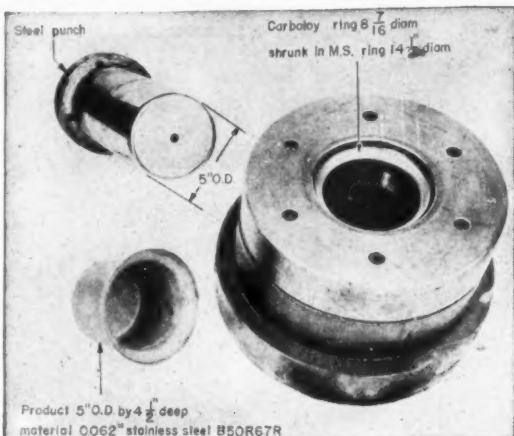
CARBIDE DRAWING DIE

Virtual elimination of both maintenance costs and die wear, and production of a more satisfactory product at less cost and in shorter time than formerly could be obtained is the achievement claimed for the Carboloy cemented carbide drawing die shown here, in continuous use in the Press Division of General Electric's Lynn River Works, West Lynn, Mass.

Previous to the installation of the Carboloy die in September, 1942, considerable difficulty had been experienced in producing a consistently satisfactory product, due to the toughness of the material being worked, a stainless steel. This caused such excessive wear and pickup on the steel dies that maintenance costs also were disproportionately high and difficulties were

experienced in meeting production schedules.

Installation of the Carboloy die, which



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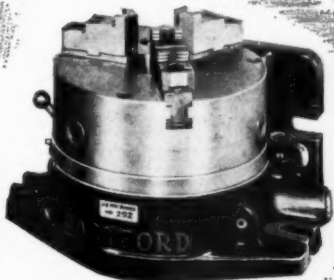
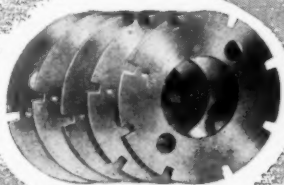


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to date has produced more than 20,000 pieces and exhibits no indications of wear, eliminated all of the difficulties previously experienced. A better finish was also obtained while production was increased and costs reduced.

AUSTRALIA'S TOOL INDUSTRY

More than 40,000 tools, varying in weight from less than a hundredweight to 150 tons each, and of a total value of \$65,000,000, were made in Australia during the last five years.

Before the war, less than half a dozen machine tool manufacturers were operating in Australia. Only two of these could compare with overseas manufacturers in the same field. Yet at the peak of war production there were 200 firms employing 12,000 persons for an annual production of 14,000 machines.

Many jobs undertaken during the war were far bigger than anything attempted in Australia previously. Figures just released show that tools of great size were made for shipbuilding and tank production. A 2000-ton steam hydraulic forging press, weighing over 80 tons, was in operation 14 weeks from the beginning of its manufacture. Three-thousand-ton hydraulic power presses and lathes of 86" swing with 50 ft between centers were

also constructed. Motor manufacturers produced motors of up to 910 hp.

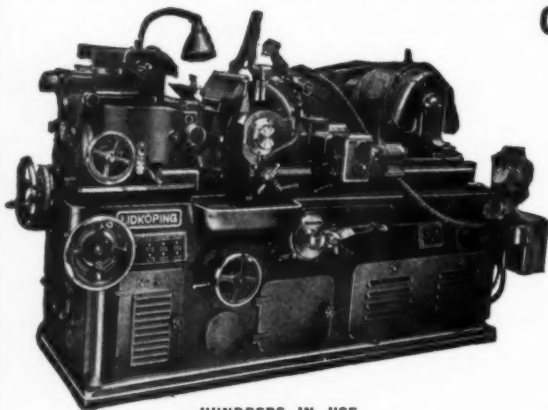
This program was organized by the Machine Tool Directorate set up by the Department of Munitions for rationalizing and co-ordinating the industry.

Thirty thousand of the total machine tools went to the Services and 20,000 to industry. Orders were also delivered on overseas accounts to the British Army in Egypt, South Africa, New Zealand and India, and also to United States and the Netherlands East Indies forces.

Much has been achieved in the production of hand tools, and a trade spokesman said recently that Australia had become self-supporting in many lines. These tools, he said, were now in regular local production:—axes, braces, calipers and dividers, carpenters' levels, files, digging forks, hand and breast drills, iron planes, ring spanners, steel rules and wood chisels.

A total of \$30,000,000 was spent on tool and gauge manufacture. The nature of the achievement is shown by the fact that while there were two factories apart from Government plants, before the war, there were 188 at the peak of production, 26,000 high precision items being produced in a single day.

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BASIC FACTS ABOUT ELECTRODES

Little information has been published in the technical press on the manufacture of welding electrodes, since most manufacturers have spent long years and considerable money to develop their formulas in this highly competitive industry. However, a few of the interesting facts about electrode manufacture are listed:

1—All electrodes for welding mild steel, i. e., types E-6010, E-6011, E-6012, E-6013, E-6020, and E-6030, use the same core wire—a good grade of rim steel, low in carbon. All variations, such as ductility, ease of welding, speed, tensile strength, etc., result from variations in the coating.

2—Rods are sold by the pound—prices in general run the same in the E-6000 series for most types and sizes larger than $\frac{1}{8}$ ". E-6011 or E-6013 rods are slightly more expensive. Faster rods have heavier coatings, so rods actually cost more per pound of steel.

Good welding engineering demands that positioning and jig costs, labor skill and labor cost, rate of weld metal deposit and relative quality of final weld all be considered carefully before deciding on welding procedure on any production job.

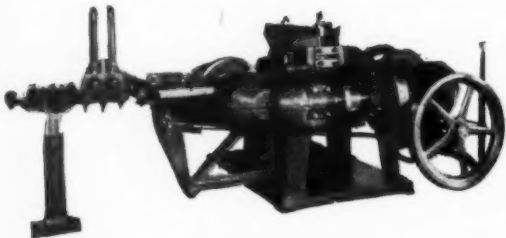
3—Polarity is probably the least understood principle in the welding trade. The reasons that some electrodes operate best on reverse polarity and others on straight polarity are not fully known in many cases.

Bare wire is used on straight polarity with electrode on the negative terminal of welding generator, because more heat is developed at the positive terminal, thus better penetration is obtained when the electrode is connected in this manner. With coated electrodes the heat is more nearly equally divided between the anode and cathode. However, some electrodes such as the AWS 6010 type do not operate satisfactorily on straight polarity because of excessive spatter.

The development of electrode coatings to operate on straight polarity d-c and a-c has been largely by "cut and try." Most electrodes which operate well on a-c also operate satisfactorily on d-c. Sometimes these electrodes operate slightly better on either reverse or straight polarity but normally it makes little difference which polarity is used. To be satisfactory for a-c welding, electrodes

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THE NILSON AUTOMATIC
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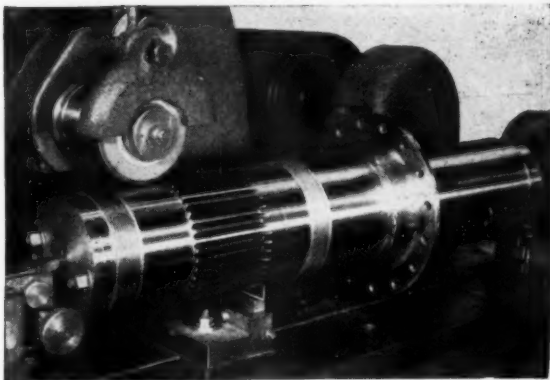


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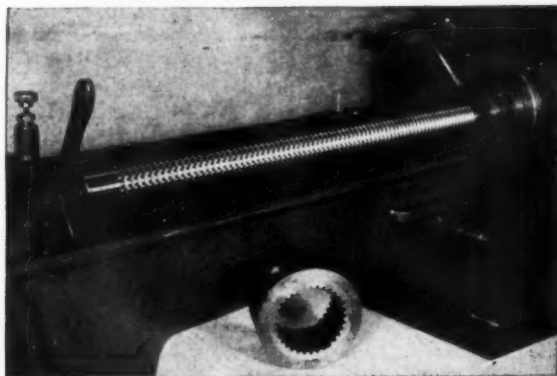
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should be practically neutral so far as polarity is concerned.

4—Coatings are made from over a hundred different minerals and organic chemicals ground to the proper degree of fineness, combined in endless ways by different rod makers to gain the desired results, mixed in paste form, and extruded on core wire in a hydraulic press. Coating is brushed off at each end, color coding is applied, rods are run through a drying and baking oven, inspected and boxed. A single modern electrode production line might turn out two or three million pounds of 3/16" rods a month.

Electrode coatings are used to perform as many as seven different jobs in the welding process, including:

a—Mechanical support for the molten pool in vertical or overhead welding.

b—Aids in striking arc.

c—Provision of an ionized gaseous conductor to help maintain the arc.

d—Formation of a cloud of gas through vaporization to keep atmosphere from molten metal.

e—Creation of a molten slag for purification of the pool by floating out impurities.

f—Creation of a solidified slag forming an insulating blanket over weld and thus providing annealing.

g—Provision for a variety of alloys from a single core wire thru addition of powdered alloys in coating.

(Courtesy—Allis-Chalmers Electrical Review.)

ZAGAR TOOL CATALOGUE

Zagar tooling is presented in a new catalogue issued by Zagar Tool, Inc., Cleveland 17, O. Equipment is designed for milling, drilling, tapping, grinding, slotting, turning and broaching operations. Collet tools include holding fixtures, indexing fixture, vertical-horizontal fixtures, air-operated fixtures, lathe chucks, collets, collet pads, broaching machines, broach holders, broaches and gearless drillheads. Illustrations show use of devices. Eight ASTE approved data sheets are used to describe products. The development of the company's activities in the broaching field is told in a reprint.

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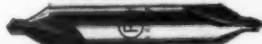


Their built-in performance features insure production-line speed, economy and dependability. Made of high speed steel, Circle "R" Combination Center Drills are listed below for your convenience.

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No.	Size	Dia. Body	Dia. Drill	Length Overall
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701	C-2	13/64"	1/16"	1 1/8"
702	D-1	15/64"	5/64"	2"
703	E-1	3/10"	3/32"	2 1/8"
704	E-2	3/10"	1/8"	2 1/8"
705	F-1	7/16"	5/32"	2 3/4"
706	F-2	7/16"	7/32"	2 3/4"
707	J-1	1/2"	7/32"	3"
708	J-2	1/2"	9/32"	3"
709	M-1	5/8"	7/32"	3 1/4"
710	M-2	5/8"	7/32"	3 1/4"
711	N-1	3/4"	1/4"	3 1/2"
712	N-2	3/4"	5/16"	3 1/2"

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GROUND WITH RADIAL RELIEF

Included angle 60 degrees. Other angles made special to order.

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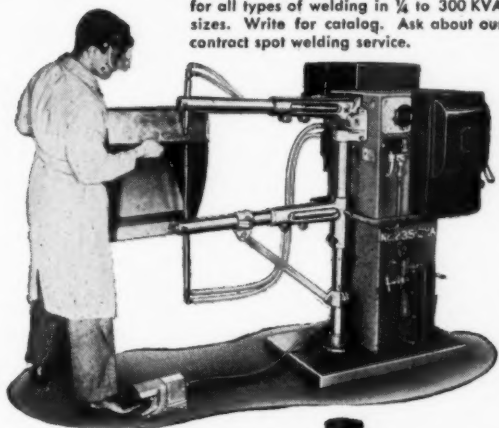
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SCREW THREAD STANDARDS

RELLEASE of an official report by the Combined Production and Resources Board now makes it possible for the American Standards Ass'n., 70 E. 49th St. New York 17, N. Y., to give the results of the conference on unification of screw thread standards held last October at Ottawa.

This conference was the culmination of months of hard technical effort on the part of national engineering committees working thru the British Standards Institute, the Canadian Standards Ass'n. and the American Standards Ass'n. Agreement was reached that there should be unification of the basic screw threads of the three countries. A technical basis was laid for such unification. The report that came out of the conference consists essentially of recommendations to the industries of the three countries as to how they may carry out the work of unification thru their respective national standardizing bodies.

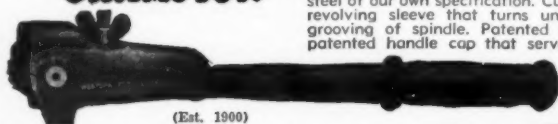
The immediate spur to completion of this job was the experience of the past war. Urgently needed equipment was sometimes kept out of action for months waiting for replacement parts because British and American screws were not

interchangeable. Had there been a common system of screw thread forms in 1939, production could have been multiplied in volume and millions of dollars would have been saved for the Allies.

For some 30 years, engineers in the countries concerned have been working to this end with increasing conviction of its importance. The present agreement is the culmination of the work of three conferences which the Combined Production and Resources Board have made possible by providing authorization under wartime restrictions and by supplying travel funds.

All recommendations of the conference have been referred to committees of the national standardizing bodies of the three countries with a view to their use in development of the national standards. The Committee on Screw Threads of the American Standards Ass'n., working under the technical leadership of the ASME and the SAE will reduce these recommendations to the usual terminology of American Standards. The technical detail is to be identical in the standards of the three countries, thus providing for complete interchangeability of threaded parts.

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LIGHT DUTY MULTI-PURPOSE SPEED LATHE

"The easiest operating Speed Lathe ever made!"
This small, light-duty Speed Lathe incorporates all of the high-quality construction features of the larger, heavier Speed Lathes . . . plus

3 Exclusive Operating Features

CONVENIENCE of Operation: Hand operating lever may be set on right or left hand side, and in either vertical or horizontal position.

EASE of Operation: It requires less than 5 lbs. pressure to open the collet.

CHOICE of Operating Sequence: Simple adjustment of two screws gives the operator a choice of two operating sequences.

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The American thread system, originally developed by Wm. Sellers for whom it is named, has a thread form with a 60° angle; while the British, called the Whitworth system, has an angle of 55°. There are also other important differences. The pitches of the British fine thread are coarser than the pitches of the American fine thread. Fortunately the pitches of the coarse thread are the same except in the ½" bolt for which the British have 12 threads per inch and the American 13. Furthermore, the Whitworth screw has a rounded top and bottom and the Sellers screw a flat top and bottom.

The new basic form of thread which was endorsed by the conference has an angle of 60° and rounded crest and root, with truncation of the crest of the screw permissible. Threaded products made to this new form will be practically interchangeable with those having the same nominal diameter and pitch made to the present American Standard. On the part of the British, however, a change in the

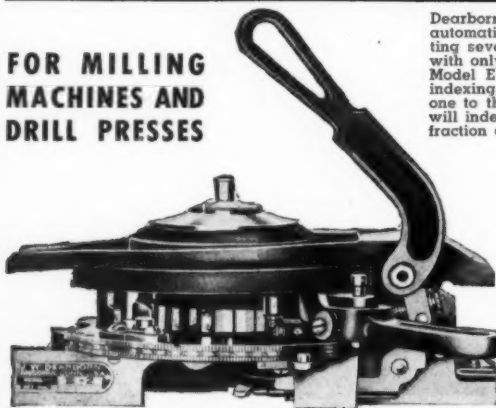
thread angle from 55 to 60° for threads of all sizes will be necessary.

This proposed form recommended as a standard is the result of efforts to retain the best features of the present forms. At the same time a series of associated diameters and pitches have been worked out which it is believed will simplify existing practice and yet provide an adequate range of choice for all general requirements. It is also felt that the proposed change will involve the minimum amount of departure from existing practice consistent with the obtaining of the object in view—a common standard for general purpose threads.

In addition to the agreement on a unified basic form of thread, agreements were reached on special purpose threads, including Acme threads, buttress threads and threads for fastening screws for precision instruments. It is expected that certain parts of the American War Standard for Acme

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**FOR MILLING
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Dearborn fixtures meet every demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting.

Model E is both a degree and a ratchet indexing fixture. It may be changed from one to the other in less than a minute. It will index any number of degrees or any fraction of a degree. Two adjustable stops

are provided so that two angles can be obtained if necessary.

Work is held by collets which take up to and including 1" round, ⅞" hexagon and ¾" square. Other shapes can be held with special collets.

Let us send bulletin giving full information.

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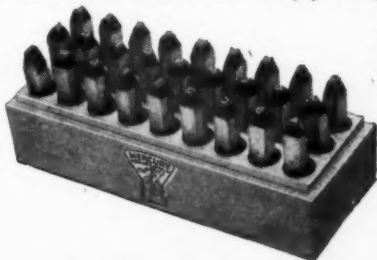
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CLEAR, SHARP, completely readable letters and figures are essential when you're putting size, catalog number, part number or any other identification on metal parts or equipment. Mercury Steel Letters and Figures produce these clean impressions on even the toughest metals and give years of service on a wide range of marking jobs.

Mercury Stamps are made of the finest tool steel, with letters and figures accurately cut to produce sharp, easy-to-read markings. Beveled shoulder makes alignment easy, assuring neatness and preventing overlapped figures. The heat treated steel shank is amply strong to withstand severest use.

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Threads (the piano stool thread) published by the American Standards Ass'n will be clarified when it is converted to a regular American Standard; that the final draft will be submitted to the British and Canadians before being approved; and that it will be adopted by all three countries as a national standard.

A standard form of buttress thread was agreed upon, particularly designed for use in applications involving exceptionally high stresses in one direction only. The agreements also included preferred series of diameters and pitches, formulas for calculating suitable tolerances and allowances, and a recommended system of gaging. The thread form has an over-all depth of engagement of 0.4 pitch, a pressure face angle of 7° and the pressure face and back face connected by symmetrical radii of suitable proportions. The formula for calculating the effective diameter was the same as that used in British Standard 84-1940 (Screw Threads of Whitworth Form) but modified to suit the

buttress thread and so arranged as to compromise the pitch-diameter factors to meet the wide range of pitch-diameter relationships.

An alternative form with a vertical pressure flank thread was in demand, the British found, particularly for larger gun work and on high pressure steam valves. An appendix added to the draft standard, therefore provides an alternative optional thread form having a vertical pressure flank.

It was also agreed at the conference that the method of calculating tolerances and allowances on Buttress threads as given in the British proposal should be accepted with the reservation that it is open to revision in accordance with any general change in basic formulas for tolerances and allowances in a unified standard for screw threads.

The conference reached agreement for unification on threads for optical tubes and cells; and on microscope objective threads (interchangeable with the Royal Microscopical Society thread).



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FLEX-TIP AIR BLOW GUN

The Original Flexible Tip Blow Gun. Positive, snappy action. Flex the tip for a gentle puff or a steady stream of high velocity. Light weight, sturdy, streamlined, indestructible. Plated, hardened steel nose. You can drop it, throw it on the concrete floor, drag it around and through machinery without injury to blow-gun or machine. No Handles. No Levers. No Triggers. No Push-buttons. No Springs. No Packings. No Leaks. Nothing to break, clog, or get out of adjustment. Furnished in standard 1/4" pipe thread.



Price, \$1.00 each



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These agreements on instrument screw-threads were based on the Swiss Horological Society standards and it was decided that gaging practices for small screws should be discussed with the Swiss.

For fine motion screws the new basic form of thread was proposed, possibly with the adoption of decimal inch diameters, particularly for sizes below $\frac{1}{4}$ ".

In order to facilitate the supply of taps and dies, three series of nominal diameters were recommended.

On bearing adjusting screws, it was agreed that the diameters and pitches should be chosen from the series recommended for fastening screws of fine motion screws.

Screw threads for optical instruments were considered under three separate headings: major, minor and optical constructional screw threads.

The major optical component screw threads included microscope objective

screw threads and screw threads for photographic or camera lens mountings.

It was recommended that the existing British and American Standards on screw threads for photographic or camera lens mountings be studied with a view to establishing uniform standards, giving particular attention to diameters, pitches, the proposed new basic thread form and length of threads to shoulder.

For minor optical components such as lens accessories, shutter cable release gear, between-the-lens shutters, and the like, it was recommended that the new basic thread form be adopted and the dimensions for such threads be based on the inch unit.

Agreement was reached on a common series of pitches for optical constructional threads on tubes and cells, to be used with the proposed new basic thread form.

On tripod mounting threads for surveying and similar equipment it was



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DRILL 6 HOLES AT ONE STROKE—ADJUSTABLE FOR ANY PATTERN!

Your drill presses equipped with adjustable MULTI-DRILL heads will

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ADJUSTABLE TO ANY DESIGN



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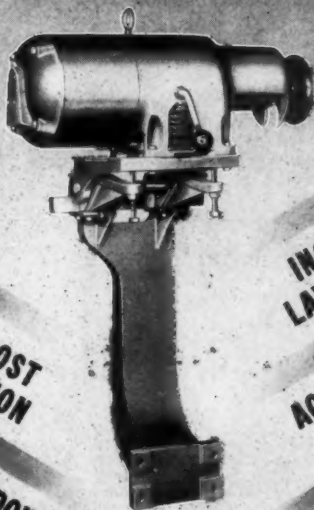
Famous for Stamina

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 $\frac{1}{4}$ " band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

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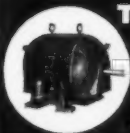
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recommended that the Service departments of the three countries be asked to reconsider their diverse standards with a view to unification.

The use of the proposed basic thread form in the development of standard screw threads for mounting cameras and similar equipment on stands or tripods was referred to the standardizing organizations in each of the three countries.

The possibility of reaching agreements on pipe threads, methods of gaging and inspection, a universal system of nomenclature and definitions relating to drawing practice, high duty studs in light alloys and on rolled sheet metal threads and associated molded plastic and die-cast threads was discussed but no agreements were reached. Arrangements were made for continuing the discussion.

The proposal on a basic thread form was by far the most outstanding accom-

plishment of the conferences and exemplifies the spirit of collaboration that prevails among the engineering professions of the three countries. Thruout the New York, London, and Ottawa conferences there was a spirit of accord which promises well for future cooperation between the three countries in the development of improved industrial methods and equipment.

STAINLESS STEEL BELLOWS

Chicago Metal Hose Corp., Maywood, Ill., announces a new 12-page booklet (SSB-46) entitled "C.M.H. Stainless Steel Bellows." The booklet contains diagrammatical cross-section views and important, up-to-date information concerning the use of Stainless Steel Bellows as equalizers, compensators, expansion joints, flexible connectors, for flow control, vapor and steam traps, thermostatic instruments, electrical controls and many other industrial applications. Also included are specification charts and other data of special interest to engineers, product designers and all who want to know more about stainless steel bellows.



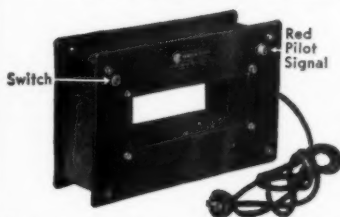
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Complete with motor . . . 4" four-jaw universal machine tool chuck and foot control switch. Capacity from 1/4" to 1 1/2" reamers. Four speeds . . . 30—45—72 and 115 RPM. Higher speed ranges available. Eliminates handwork. Speeds production. Mail your order today. The new Greaves streamlined reamer-driver will come your way— pronto!

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A necessity where machine tools are used.

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can cost less than
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It is frequently more economical to use a special Detroit tap than a lower cost "standard". Reason for this is that DETROIT really designs specials "to the job". At Detroit that means taking into account not only general thread specifications, but characteristics of the materials to be tapped, tolerances required, whether another operation—such as drilling or reaming, or a second tapping operation—can be performed by the same "special".

It would be difficult to determine whether the machines which Detroit Tap and Tool has developed for producing all kinds of specials or the knowledge of tap design problems presented by different materials are more responsible for the outstanding success of DETROIT specials.

Our extensive field engineering force, as well as our Detroit design engineering staff are at your disposal. They will be glad to help you cut machine hours, reduce rejections, eliminate operations and improve the quality of your tapped holes.

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CUTTING FLUIDS FOR TAPPING

MATERIAL	CUTTING COMPOUND
Aluminum Alloys	$\frac{1}{2}$ Lard Oil & $\frac{1}{2}$ Kerosene
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	Dry
Cast Iron	Small Amounts of Mineral Lard Oil, Soap, or Tallow
Copper	**Cresol z-3* & Paraffin Oil
Malleable Iron	No. 3313-4 & Paraffin Oil
Monel Metal	Sulphurized Oil
Wrought Iron	Lard Oil & Kerosene
Mild Steel	Sulphurized Oil
Tool Steel	No. 3313-4 & Paraffin Oil
Stainless Steel	Sulphurized Oil
Tough Alloy Steels	Lard Oil & Kerosene
Cast Steel	Sulphurized Oil
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**Cresol z-3* is an excellent heat dissipator and does not stain the work. It is rather expensive but may be used in a 10% solution of Paraffin Oil.

(Data—Courtesy Westinghouse Electric Corp.)

SCREW DRIVING OPERATIONS

Problems to be met in screw driving operations vary with the types of screws being used, the sizes of the screws, the volume in which they are being used and other factors.

One outstanding development in screws during recent years is the Phillips head. The use of Phillips head screws, continually on the increase, calls for the use of special driving bits to fit these heads. Many different manufacturers are producing screws with this type of head. Consequently, many manufacturers of screw drivers, of whatever type, are supplying such bits with their tools. It is important to notice, in this connection, that some firms specialize in supplying power bits and drivers, for both slotted-head and recessed-head screws, for the entire range of screw sizes and for almost all makes of electric, pneumatic and spiral screw drivers.

Portable electric screw drivers and portable electric drills are sometimes made up and sold as "twins", by some of the leading builders of portable tools. Such sets are highly convenient where the work handled involves drilling holes

during assembly, and then driving screws into the drilled holes. If workmen have both portable drills and portable screw drivers close at hand, the work is expedited.

One manufacturer that has made such tools in the past provides the screw driver with a positive clutch that allows the spindle to remain idle, for finding the slot in slotted screws. The positive clutch engages the bit only when pressure is exerted. The screw driver is also equipped with an adjustable friction clutch, so the tool can be set to drive screws to any predetermined degree of tightness, within its range.

Portable screw drivers for heavier duty are often air-powered, tho they may be electric when desired. These heavier tools are often made to serve as combination drills and drivers. Modern air-driven tools have their rotors mounted on competent ball bearings. These bearings develop little or no wear. In consequence, the rotors are kept in the proper location permanently, in relation to the cylinders. Therefore, the rotor blades are maintained in the most efficient operating position.

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To help you in purchasing surplus property, veterans' clubs have been established in each War Assets Administration Regional Office.

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To War Assets Administration

Please send me information on the availability of the following types of grinders:

MAKE	MODEL	SIZE
..... Centerless grinders
..... Bench grinders
..... grinders (other)

Name:

Firm:

Address:

City: State:

27-3

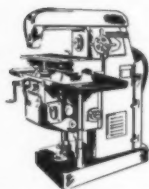
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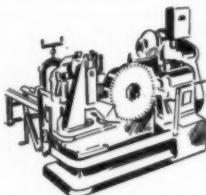
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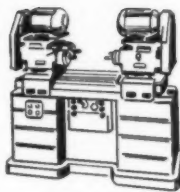
MACHINE TOOLS



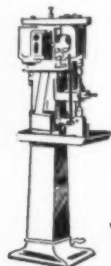
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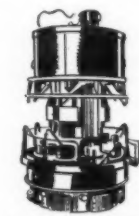
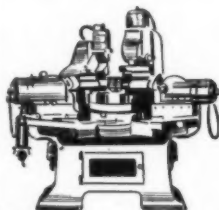
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These machine tools must go to work. You need the profits. America needs the production. Taxpayers need maximum recovery to the government of their original cost. On hand, at every War Assets Administration office in the U. S. there are hundreds of these machines. Nearly every category of modern production equipment can be obtained at low cost. You have a unique opportunity to initiate new enterprises or modernize old... and at the same time do your country an important service. Check this partial list over carefully for equipment you can use. Then write, wire, or phone your nearest War Assets Administration office for detailed information, or if you prefer mail the coupon.

CHECK LIST OF SPECIAL MACHINE TOOL BUYS!

Here are a few of the many thousands of machine tools available through War Assets Administration.

MACHINE (Function)	TYPE	SIZE OR CAPACITY	Quantity Available Now
Boring, Drilling & Milling	Horizontal	Under 2" to 6"	309
Boring & Turning Drills	Vertical	Under 50" to 130" Swing	443
Boring Flange Rail Tools and	Vertical		87
Precision Boring Machines	Horizontal bridge—single end Horizontal bridge—double end	Under 8" to 14"	484
Drills	Under 15" Cap. Up to 23" Swing 15" to 1" Cap. 16" to 34" Swing	Under 8" to 14" Under 15" Cap. Up to 23" Swing 15" to 1" Cap. 16" to 34" Swing	336 267 187
	Bevel columns—single updrift	Under 15" Cap. Up to 23" Swing 15" to 1" Cap. 16" to 34" Swing	730 1168
	Sensitive Floor & Pedestal Box columns	Under 15" Cap. 12" to 23" Swing 15" to 1" Cap. 16" to Over 34" Swing 1" Cap. and over 34" Swing and over	928 1673 434
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MACHINE (Function)	TYPE	SIZE OR CAPACITY	Quantity Available Now
Drills	Sensitive Floor & Pedestal Upright Type—Bevel columns Sensitive Floor & Pedestal Upright Type—Bevel columns Heavy Manufacturing Type Spec. Kingsbury Way & Vertical	Up to 38" Swing Up to 38" Swing Up to 38" Swing	549 161 294
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Gear Cutters	Bevel Type not incl. Pattern Type in Bevel	Up to 36" Diam.	377
Gear Tooth Finisher	Grinding Formed Wheel Type		140 190
Gear Tooth Sapper	External only Comb. External & Internal		80 87
Gear Tooth Shaver	Rotary Type		133
Grinder	Internal Cylinder—Plain External Cylinder—Universal Centerless—Internal and External Cool. Chk. Pin Valve	Up to 30" Swing Up to 16" Swing All sizes	1730 247 687 333 83 348
	Internal Cylinder—Mechanical Feed Internal Cylinder—Hydraulic Feed Internal Cylinder—Internal Cylinders Auto. Stk. Comb. Hole & Face Internal Cylinder—Auto. Stk. Planetary Type Internal Cylinder—Auto. Stk. Centerless	All sizes Up to 43" Swing Under 12" Swing 16" Swing and over Under 16" Diam.	330 1094 131 137 39
	Surfaces—Hole, Spindle Rotary Table Surfaces—Vertical Slotted Spd. Rotary Table Surfaces—Reciprocating Hole, Spindle Hole Feed Surfaces—Reciprocating Hole, Spindle Power Feed Thread—External only Thread—Internal & Internal Tool & Cutters—Universal Drill Single Point Tool Beach—Double End Beach—Single End Flange—Double End —Dry Flange Comb.—Wood & Dry Beach Floor & Stry —Swing Frame Comb. Shifter & Buffer	All sizes table diam. 12" to 48" Table Diam. 12" length work cap. and over Under 16" to 130" length work cap. All sizes 8" Cap. and over All sizes All sizes All sizes Up to 8" Wheel diam. Up to 56" Wheel diam. 10" to 16" Wheel diam. 133	146 274 127 148 840 635 82 691 348 438 2674 1108 651 214 185 1865

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Use this coupon to conserve your time. Print in a brief description of the make, type, model, and size of machine in which you are interested. We will determine in advance our stock situation on the machines and inform you quickly. No obligation, of course.

To War Assets Administration: Do you have in surplus stocks the following machine tools? Where are they located? What is their condition?

Type.....Make.....Model.....Size.....

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Name.....Tel. No.....

Title.....

Firm.....

Address.....

City.....State.....

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**1/2 TO 5 H.P.
STANDARD MAKES
AT LOW COST**

Speed Lathes like this are just one of dozens of kinds of modern machine tools now available from government surpluses. For instance look at the equipment shown on the three preceding pages. Of immediate machine tool needs, there is scarcely one which cannot be met quickly, and at low cost, from War Assets Administration stocks—and additional equipment is being declared surplus regularly. One of industries' and government's major post war tasks is to put this equipment to productive use quickly. More specifically—where can you use one or more of these speed lathes profitably? Find out today and contact any War Assets Administration Office.

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W.A.A. Regional Office	1/2 HP—	1/2 to 1 HP	1 to 2 HP	3 HP+
Detroit	294	231	147	22
Chicago	27	66	37	66
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Cleveland	67	32	19
New York	6	3	3
Denver	15	66	26
St. Louis	155	14	6
Minneapolis	67	11
Spokane	3	11

**CHECK AND
MAIL TODAY**

To War Assets Administration:

Without obligation, please send me the following information on lathes:

NAME MODEL SIZE

Speed Lathes ☐

Multi-cut Lathes ☐

Other types ☐

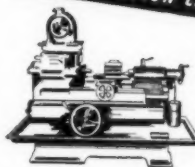
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City

**SMALL PIECE MULTI-CUT
PRODUCTION LATHES**



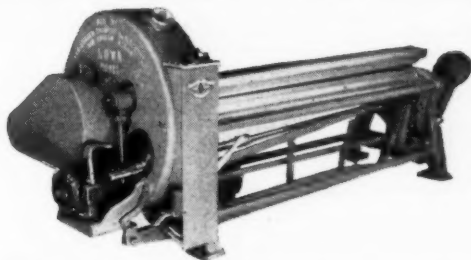
These small lathes may be stripped and recoiled for any special kind of small production work. Machines located principally in Birmingham, Boston, Chicago, Cleveland, Detroit, New York, Philadelphia, Richmond and St. Louis Regional Offices.

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SPEED UP YOUR PRODUCTION LINE WITH THE FORMER
THAT HAS EVERYTHING.

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SPECIAL FEATURES: Power adjustment on the bending roll. Dial indicator conveniently located for operator's observance when operating finger-tip controls. Power opening and closing of arm or knock-down. Initial type, but different in that you have the minimum flat place on cylinders formed due to the way rolls are positioned. Rolls are so geared that you have perfect mesh even when the feed rolls are widely separated. All three rolls motor driven.

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A VAILABLE at this time in 5" and 6" diameter rolls in lengths of 42" to 96" ranging in capacity from $\frac{3}{8}$ " to the lightest metals.

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WHAT'S NEW IN METALWORKING

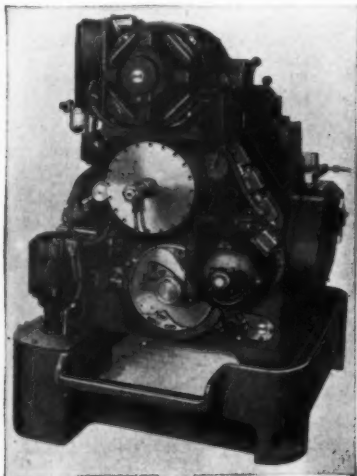
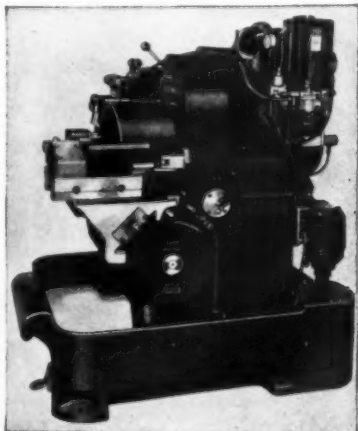
ACME-GRIDLEY SINGLE SPINDLE "CHUCK-MATIC"

A NEW 12" capacity single spindle automatic chucking machine announced by The National Acme Co., 170 East 131st St., Cleveland 8, Ohio, is said to be radically different from any previous single spindle chucks seen in this country.

Heavy duty, high production machining operations on castings, forgings, and tubing parts up to 12" in diameter can be effectively performed. Named the "Chuck-Matic", this new chucking machine specializes in straight, internal or taper boring, form turning or form boring, external turning, forming, facing and chamfering.

Use of carbide tools, high production work, short-run job shop operations, high

cutting speeds and feeds, operator inexperience, fatigue and safety of operators have all been considered in some definite manner in the design.



Better control of set-up time is a fundamental. A single chuck holds work, only two slides need to be tooled, slide tools are mounted in the most accessible position, machining cycle may be instantly interrupted for re-setting tools during set-up by pushing lever "F" to stop feed and operating lever "R" to reverse slides, and finally, cams controlling working and clearance cycles of tools are accessibly placed.

For an automatic having 12" chuck capacity, the designers have evolved a machine requiring little effort and skill to operate. Only a rudimentary machining

SHELDON

S-56

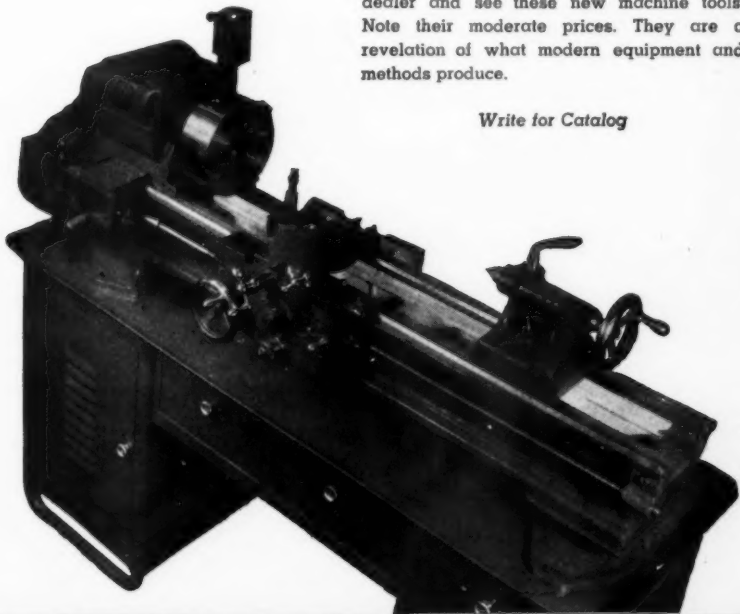
. . . those built in the new SHELDON machine tool plant? Always good lathes, these new SHELDONs are even better, not only in design refinements but in extreme accuracy, greater work

**Have you seen the new
SHELDON Lathes...**

capacity for size, "sweeter" handling and actual beauty of finish. Only a set-up like the new SHELDON plant could build such lathes—a specially designed building, the most modern manufacturing methods, complete tooling with row on row of the finest, most modern manufacturing equipment.

Make it a point to stop in at your SHELDON dealer and see these new machine tools. Note their moderate prices. They are a revelation of what modern equipment and methods produce.

Write for Catalog

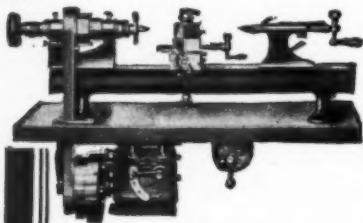


SHELDON MACHINE CO. Inc.

*Manufacturers of Sheldon Precision Lathes • Arbor Presses • Vises
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PRECISION BENCH LATHES



With Motor Drive Unit
(9 Speeds)

Dependable for long service on exacting work which they handle with facility and speed. Records of 20 years continuous service are not unusual.

Write us your requirements. Now 4 good sizes, 1/4", 1/2", 3/4" and 1" collet capacity.

Stark Tool Company

Established 1862

Waltham, Massachusetts

Originators of the American Bench Lathe

knowledge is necessary to master the simple four-step operating sequence developed.

1—Load work—chuck jaws are opened by depressing pedal near front edge of pan; jaws are closed again by releasing pedal.

2—Start spindle—safety locking spring plunger pushed and held with left hand, and lever "S" pulled with right to start spindle.

3—When cut is finished, slides recede, spindle stops, and coolant flow is automatically cut off.

4—Unload work—pedal is depressed after slides are retracted and spindle is stopped.

The machining cycle is entirely automatic.

Operator is always in position at front of machine; all controls are operated from this position and work is chucked from front. One person may operate as many machines as the cycle time of the job will permit; one machine is loaded while another is cutting.

Chuck is positioned 41" from floor level—natural elbow height. Face of chuck is but 14" from main splash guard's front edge, and the slides are well retracted from chucking zone to rid that area of annoying obstructions during chucking. As chuck jaws are opened and closed by air power controlled by pedal, practically no physical effort is required to operate chuck.

To obtain rigidity and simplicity, only two main castings are used. The heavy pan and one-piece frame are doweled and bolted together as a rugged, compact unit, which with motors, toolholders, slides and other essentials make up a chucking automatic weighing 7,350 lbs and requiring a space 45" wide x 64" long x 64" high.

Designed for "all carbide tooling", the "Chuck-Matic" handles relatively large diameter forgings and castings at high surface speeds usually needed for efficient carbide tool operation. The stubby, compact frame absorbs the force needed for high speed cuts in tough alloy materials at heavy feeds. Tests have demonstrated that shake cannot be detected in the machine's operation, thereby ruling out objectionable tool chatter. Proper support for carbide tools is a cardinal rule; the massively proportioned slides offer such support—a further factor in dampening shake and tool chatter. As means for getting the steady flow of power required for carbide tools when cutting alloys of low machinability rating, a very short linkage is used between slides and cam drums.

Three motors are used. Spindle and tool cutting movements are powered by a 15 hp motor mounted directly over spindle

at rear of machine. High speed clearance movements of the slides are controlled by a 2 hp motor, and a $\frac{3}{4}$ hp motor operates the heavy pump employed for circulating coolant.

Cutting tools are mounted on the compound slide and cross slide positioned opposite each other on machine's frame. Solidly proportioned, these slides are set on an angular type base and supported in frame without overhang.

Compound slide at right hand side of machine carries tools for straight or taper boring, form boring or form turning, drilling, reaming or grooving. Maximum boring length is $3\frac{1}{2}$ "—turning length 4". End-working tools return distance for chuck clearance is 6". Moving in two directions during operating cycle, the compound slide approaches working position at high speed by moving longitudinally to point where cutting is to start, then in towards work. When ready to start actual cut, slide movement is shifted to low working speed, under power of main drive motor.

Located at left, the cross slide contains tools for forming, turning, facing and chamfering. Cross slide also approaches chuck at high speed, shifting over into low working speed when starting point of cut is reached.

An ingeniously designed telescoping guard is used to prevent fine chips, dirt, and coolant from accumulating on slide ways, which are angled steeply to permit coolant to wash chips down easily into pan.

Wear on slides is compensated by use of adjustable gibs.

Slide movements are controlled from cam drums located directly beneath slides. Cam drums can be pulled out on pilot shafts for convenience when setting cams.

Positive stops are provided for all slides, with standard adjustable stops being employed to limit slides' longitudinal movement. Double positive stops are used on compound slide; in addition, there is a positive type stop on top of compound slide particularly for use in controlling depth during long boring cuts.

A three-jaw universal 12" swing chuck, controlled by a 12" diameter air cylinder, is used. To obtain proper chucking pressure for different jobs, a reducing valve and sight gage are included in air circuit.

Mounting correct gears on shafts in the case above and to right of spindle, provides a range of spindle speeds from 143 to 524 rpm. When desired, spindle speeds can be doubled by changing motor pinion and driving gear.

High and low speed cams are mounted on a disc at rear of machine. Quickly and

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Counter Shaving
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Cincinnati	MAN 3929	Houston	C 6564	St. Louis	CE 3821	Toronto	BA 5191
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easily accessible, they can be changed to obtain the same feed for a shorter cam rise, if required. Saving in short-run jobs' set-up time is obtained by this method, as it is not necessary to change cams on the drums controlling slide movement.

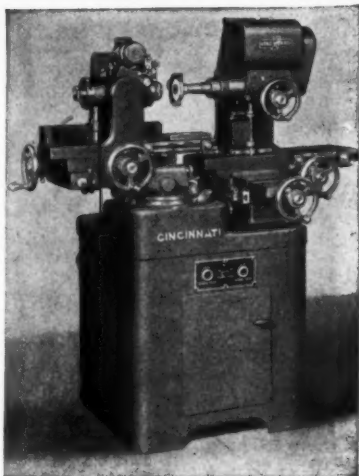
A Snap-lock limit switch is used to prevent the air control circuit pedal from opening chuck while spindle is in motion. When air pressure falls below an established minimum, a safety valve operates to stop all machine movements.

Both of operator's hands are forced from machining area when cutting action starts. He must push and hold safety locking spring plunger with his left hand, and pull starting lever with his right. Consequently the machine's spindle cannot be rotated with operator's hands still in cutting zone.

In addition to the safety devices mentioned, a number of limit arrangements are built-in to prevent damage to the machine itself.

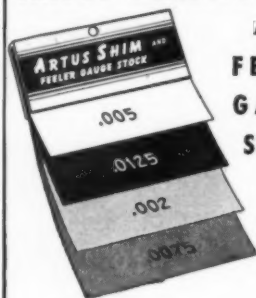
MONOSET TOOL GRINDER

Cutter shapes involving convex or concave radii, and having straight, tapered, or helical teeth can be resharpened quickly or ground from the solid without the use of special attachments on the Cincinnati Monoset Cutter and Tool Grinder,



a product of the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. While the Monoset may be used for conventional

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*Read this excerpt
from article in
American Machinist*

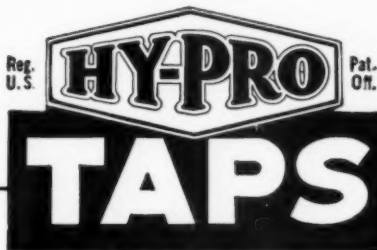


"High-speed steel ground thread taps cost more than cut thread taps, but cost per tapped hole is much less, as when tapping at high speeds a ground thread tap will usually produce at least six times as many holes as a cut thread tap. It also requires less power. All conditions being equal, the ground thread tap requires about one-fifth the sharpening for the same number of tapped holes and is less easily broken."

PROMPT DELIVERY: Many special as well as standard taps in stock.

**COMMERCIAL • PRECISION • SPECIAL
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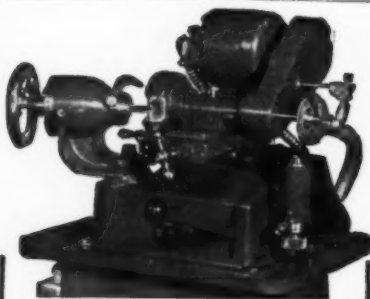
HY-PRO TOOL CO., New Bedford, Mass. U.S.A.

resharpening of end mills, reamers, counterbores, form cutters, and a multitude of special tools, it is particularly useful when it becomes necessary to prepare quickly, special "trick" or "problem" cutters, special sized drills, etc.

The flexibility of machine movements and many built-in features enables most jobs to be performed with a single chucking. By thus eliminating time-consuming multiple set-ups, the cutter is produced very quickly and excellent concentricity is assured, with subsequent smooth cutting action and long tool life.

The generation of accurate radii is accomplished by the large, smooth action turntable base upon which the workhead unit is mounted. The workhead may be swiveled thru 253° and adjustable stops are provided to accurately limit its arc of travel. An accurately adjustable transverse slide provides for grinding of radii which have their centers offset from centerline of the workpiece.

An especially useful feature of the Monoset is the built-in spiral lead mechanism which provides a means of generating right-hand or left-hand spirals having leads as short as 1-13/16". The various spiral leads are selected by a single simple adjustment, provided with a graduated dial, without recourse to complicated change gears.



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Fast—easy to operate. Complete—no parts to change. Capacities—No. 2 to 1 1/4" hand taps—with interchangeable heads.

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Workhead spindle is provided with a collet chuck, 13 straight collets ranging from 1/8" to 1 1/4" diameter, and six taper collets. An adjustable tail center support is provided for centered work and adjustable, spring tensioned stock supports are provided for uncentered work.

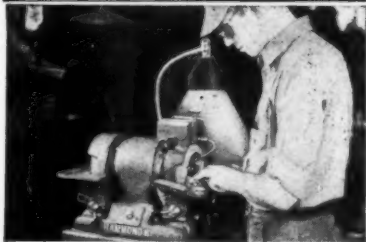
Accurate indexing of either straight or spiral fluted cutters is provided by a pair of easily-operated workhead spindle indexing mechanisms. Straight fluted cutters, or other jobs not involving spiral leads, are indexed by a simplified ratchet type indexing device. Indexing of spiral fluted cutters is accomplished by a spring-pressed pawl type mechanism with interchangeable index plates.

Cylindrical grinding is made possible by the workhead spindle motor drive, which is supplied as standard equipment.

Grinding wheel spindle is supported by three sliding elements which permit grinding wheel to be moved longitudinally, transversely, and vertically. Hand-wheel control for each slide is provided with a micrometer dial for accurate positioning of grinding wheel and all slides are provided with adjustable micrometer-type stop dogs to limit slide movements accurately.

Convenient, easily read clearance angle scales are provided on vertical and trans-

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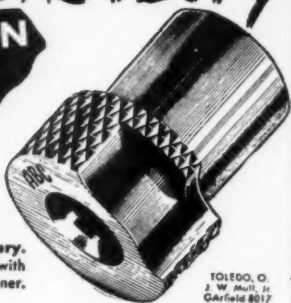
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This picture shows how a **RUSNOK** head is used to convert an idle surface grinder into a modern milling, drilling, boring machine capable of performing a wide range of high speed, precision operations. Uses many types of cutters on a wide range of work. Easily mounted — tilts to any angle. Large size spindle (No. 9 B & S taper). Takes 1/16" to 3/4" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. 1/2 h.p. motor. Specially engineered by **RUSNOK** to meet modern demands for high speed, high precision, heavy duty end mill operations. Prompt delivery. Write for illustrated Circular and prices

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verse wheelhead slides to simplify grinding of tooth clearance angles.

A two-speed drive for grinding wheel spindle helps maintain correct cutting speeds with different size grinding wheels.

A high speed spindle attachment for small mounted wheels provides a means for accurate internal grinding operations. This attachment is also extremely useful for jobs which require use of small diameter wheels in conjunction with either

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Simple, efficient lubrication of all sliding elements is assured by a pair of "one shot" lubricating systems and all operating mechanisms are fully enclosed to prevent entrance of grit and dirt.

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LE BLOND CRANKSHAFT LATHES SPEED CAR PRODUCTION





Assisting in the production of America's cars and trucks, The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio, is running at full speed to keep a steady stream of LeBlond automatic crankshaft lathes flowing to America's leading automotive manufacturers.

Using mass production methods (wherever possible on special purpose

machines of this type), and other specialized LeBlond techniques, this Cincinnati manufacturer is delivering a great variety of automatic machine tools at a rapid rate to America's automotive centers.

Shown on the accompanying photo are the LeBlond 1 LB, 2 LB, and DM machines—a total of 15 on the assembly floor



DIAMOND TOOLS

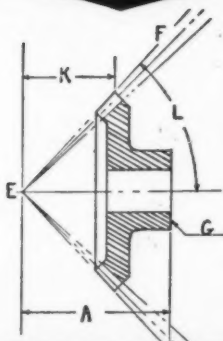
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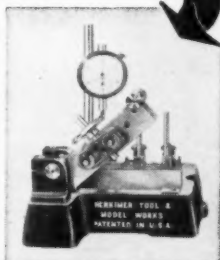
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For holes from $\frac{1}{16}$ " upward, 15 different sizes.

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at one time in the LeBlond Cincinnati plant. Similar activity is also taking place at the LeBlond Norwood plant where the LeBlond 6 AC's and 7 ACL's are produced.

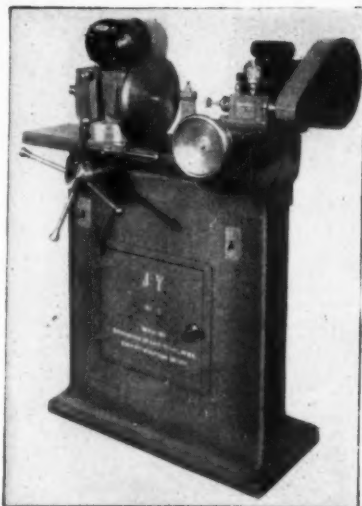
Automatic machines such as those manufactured by LeBlond, with a high hourly rate of production, are gaining time and making possible the manufacture of cars and trucks at the unprecedented rates which the automotive industry is striving to attain.

LeBlond's line of automatic crankshaft lathes is said to be complete and well rounded, for performing all turning operations, such as, rough and finish turning, filleting, cheeking and shaving.

PRECISION INTERNAL GRINDER

A new Precision Internal Grinder with the flexibility to grind radii and tapers on any tool and die parts, is announced by Superior Machine & Tool Works, 528 Butterworth St., S. W., Grand Rapids, Mich.

Called the JY No. 2, it is especially designed to handle a wide range of precision toolroom work, grinding anything from $\frac{1}{4}$ " diameter up. The JY No. 2 is a high speed grinder, with a spindle speed of 12,000 to 27,000 rpm and a work head



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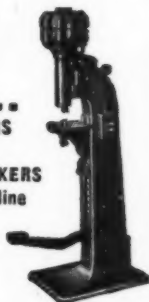
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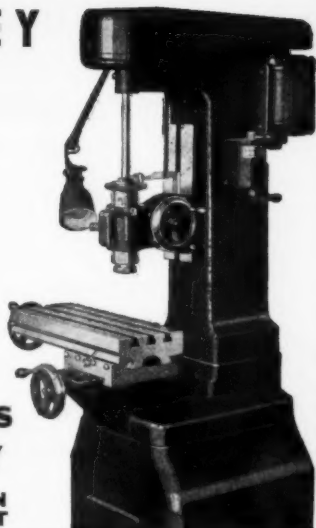
Highly satisfied tool room foremen express this opinion about the Linley Milling and Jig Boring Machine. Its quick, accurate set-up and changeover for work on small dies, jigs, fixtures and patterns cut costs sharply . . . keeping large, expensive machines for the big tooling jobs.

Rotating parts are carefully balanced for smooth running. There are 8 spindle speeds to 4250 r.p.m. No backlash in quill travel. Needs only 2½ sq. ft. of space; table size (7" x 17½") is ample.

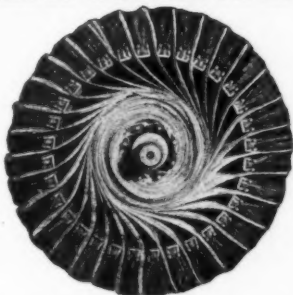
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Vonnegut Brush-Backed Abrasive Head with end cap removed, showing magazine loading of 32 strands of abrasive coated cloth.

It's *not* experience that is the prime factor in the efficient operation of the Vonnegut Brush-Backed Abrasive Head. A new man can quickly acquire the technique of applying it to various classes of work . . . and in a few days he can do faster and better work than can be accomplished by highly skilled workers on other machines.

This Vonnegut Abrasive Head is versatile and effective . . . an efficient deburring tool . . . useful for removing edge and surface irregularities from small castings . . . an essential part of the equipment of every metal-working plant.

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ONE, FOUR and SIX spindle automatics maximum capacity 2½" round. Hand Screw Machines and Universal Turret Lathes maximum capacity 3" round. Castings and Forgings machined maximum 10" diameter, 8" length, 15 pound weight. Secondary operation equipment for milling, drilling, tapping and assembling. Fabricators of aluminum, brass, steel and their alloys.

Screw Machine Specialty Co., 5600 Butler St., Pittsburgh 1, Pa.

speed of 200 to 400 rpm. Pre-loaded Super Precision Ball Bearings carry the spindle and assure constant accuracy.

Altho the JY No. 2 is compact—only 36x68" floorspace needed—it has a capacity of 10½" swing, with an 11" longitudinal travel. The 10½" faceplate with Heater controlled switches is standard. Another timesaving advantage is that the machine does not have to be stopped to measure the work. Friction drive clutch and hand lever puts machine out of gear and applies brakes.

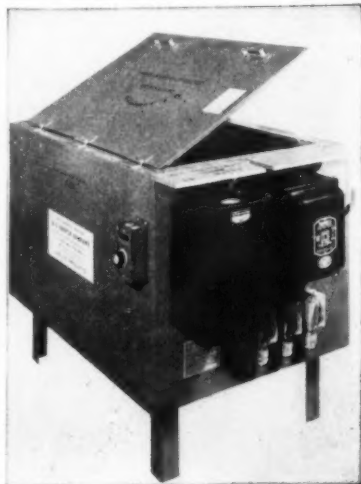
Grinding spindle is driven by ½ hp. 2450 rpm motor, and work spindle by 1/6 hp, 1100 rpm motor. Both are dust proof and fully enclosed.

Because of its small size and high speed, high precision operation, the JY No. 2 is especially suited to toolrooms, where space is at a premium and accuracy vital. Full details and prices are available from the manufacturer.

OXIDIZING TANK

The D. C. Cooper Co., 1467 So. Michigan Ave., Chicago 5, Ill., announces development of a new electrically heated Oxidizing Tank, equipped with thermostat control and thermometer.

It is constructed of heavy gauge steel and has heating elements on two sides



and the bottom for low or high temperature range. Each set of heaters has indi-

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**SOCKET HEAD
CAP SCREWS**

**MILLED
FROM BAR**



**HOLLOW
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**MADE OF
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CONSTRUCTED AS PER SPECIFICATIONS OF U. S.
NAVAL AIRCRAFT FACTORIES
**BUTTERFLY FILING and
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(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D—10" Table; Model E.L.—12" Table. Model No. 14—14" table and heavy pedestals for all our machines.

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IMITATIONS**

Our machine
carries the Butterfly
trade mark.



Registered U. S. Patent Office



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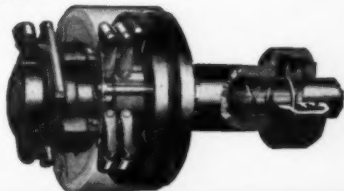
You can eliminate many unnecessary trips by your men to the Oil Barrel for lubricant, if you use MULE-PULL CLUTCHES. Unlike other types they have an ANTI-FRICTION, ROLLER-LEVERAGE SYSTEM that requires no lubrication whatever. The Loose-Pulley Sleeves of these Clutches have ECONOMICAL RING-OILING LUBRICATION that is copious without waste and proportional to the speed. One application of oil lasts from 30 to 90 days and you

are protected

at all times against scored Shafting and ground-out Loose-Pulley Sleeves, together with the costly shutdowns that accompany such failures.

**MULE-PULL
CLUTCHES**

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BROWN ENGINEERING CO.

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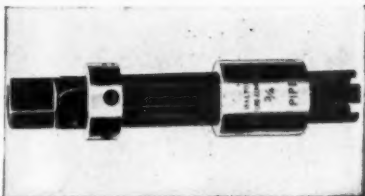
visual switch with pilot light. Any one set of heaters can be turned on without using the others.

This unique equipment was especially designed for heating D. C. Oxidizing Compound, a new Cooper product for producing a deep uniform blue-black finish on steel parts that will not peel, rub off, crack or chip. It is rust-resistant, adds life and appearance to auto and aircraft parts, metal cutting tools, machine parts, saws, bearings, screws, bolts, nuts, springs, guns, gears, piston rings, nails, hammers, axles, vises, radio and many other steel parts. A single bath produces a rich black surface within 5 to 15 minutes, without changing the dimensions.

EXTRACTORS FOR PIPE TAPS

Designed especially for the accurate, quick and easy removal of broken pipe-threading-taps, a group of 10 new pipe tap extractors has been added as stock sizes by Walton. These pipe tap extractors are designed on the same principle as the well known Walton extractors, for hand and machine screw taps, which have been the accepted standard for more than 37 years.

These pipe tap extractors are immedi-

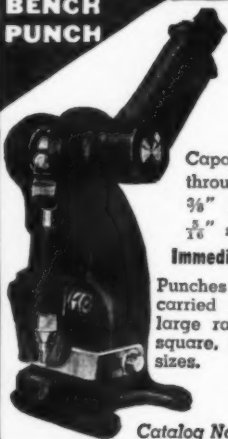


ately available for all sizes of pipe taps from $\frac{1}{8}$ " to 1" inclusive for both regular and interrupted thread styles. They are made by The Walton Co., 98 Allyn St., Hartford 3, Conn.

MARKING EQUIPMENT

A new catalog has been issued by Wm. A. Force & Co., of 216 Nichols Ave., Brooklyn 8, N. Y. This catalog shows a complete line of Metal Indenting, Marking and Numbering Machines as well as steel type and holders, steel stamps, detail presses and other marking equipment for use by industry. Copies will be gladly sent to all interested parties upon request.

FRONT LEVER BENCH PUNCH



**STURDY
DURABLE
HANDY**

Capacity: $\frac{1}{4}$ " hole through $\frac{1}{4}$ " steel or $\frac{3}{8}$ " hole through $\frac{5}{16}$ " steel.

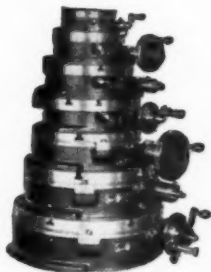
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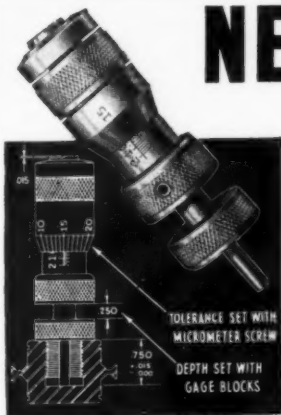
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SCHNACKE ADJUSTABLE FLUSH PIN GAGE



With this new adjustable gage, you can have an accurate Flush Pin Depth Gage quickly and save time and money. Serves many varied gaging purposes in production and inspection. Set consists of 3 interchangeable depth rods (1"-2"-3") and 1" diameter sliding anvil, adjustable to required depth. Sliding tolerance feelers at the top are set with micrometer screw from plus or minus .000 to .200 and locks firmly with double locks. Standard set applicable to any decimal dimension up to 3.00".

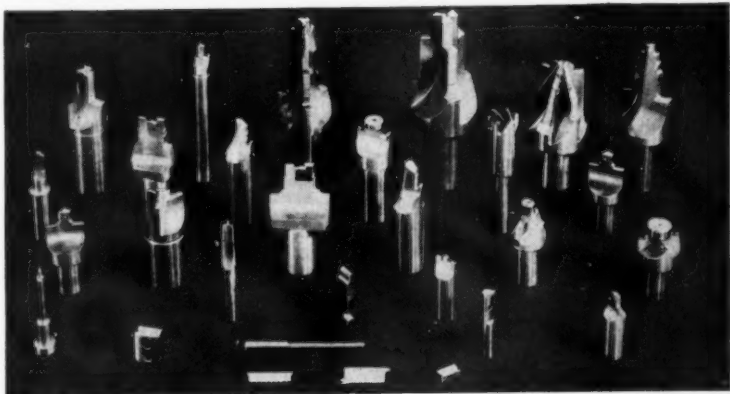
SCHNACKE, INC.

Special anvils and longer rods are also available. Write for descriptive circular.

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Evansville, Ind.

"FORM-GRINDING" - - - is our business!



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J & S TOOL CO.

(MAKERS OF J. & S. "FLUID-MOTION" FORM-DRESSERS)
477 MAIN ST. - E. ORANGE 2, N. J.

LOVEJOY TYPE "F" SLOTTING CUTTER

Sensitive control of blade settings, obtained by the addition of a screw adjustment to the blade "positive-locking" device, is the principal feature of the redesigned Type "F" Slotting Cutter manufactured by Lovejoy Tool Co., Inc., Springfield, Vt.

As shown in the phantom view, each blade is set at a slight angle to the cutter body. When blade adjustment is required—either for resharpening or for exact control of slot width tolerances during milling—the positive-locking device is loosened by unseating a taper pin. A recessed-head screw, at the bottom of each blade, is then turned to move the blade up (or retract it) the exact amount required. When properly set, the blade is positively locked in the body by reseating the taper pin.



Savings on carbide are effected when resharpener because each tip need be

moved up only a sufficient amount to be cleaned up. An additional long-life provi-

LITTELL

Pres-Vac

SAFETY FEEDER

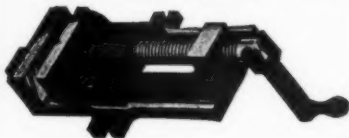
**KEEPS
HANDS
OUT OF
DANGER ZONE**



YOU owe it to your workmen—to safe, fast production—to keep their hands out of danger zone—with the Pres-Vac Safety Feeder. Vacuum pick-up. Handles flat pieces of various weights and sizes. Trigger action. **Me- Request** chanical Pickers available. **Bulletin**

F. J. LITTELL MACHINE CO.
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YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, inches	Opens, inches	Weight, Pounds
1D	3 1/2	3 1/2	12 1/2
2D	5	5 1/2	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

USE

Fluid-Motion for Modern form-dressing

ONE

**SETTING
HANDLE
CONTINUOUS MOTION**

J & S Radii & Angle Dressers in the "Fluid-Motion" series are among the finest precision dressing instruments procurable . . . regardless of cost. There is a standard model to fit most form-dressing requirements.

Features

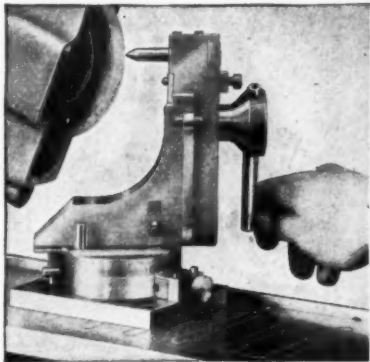
Fluid-motion dressing
.0001" accuracy
Automatic centering
7" & 14" wheel capacities
Large range yet compact
Chatterless and dustproof

Write for catalog

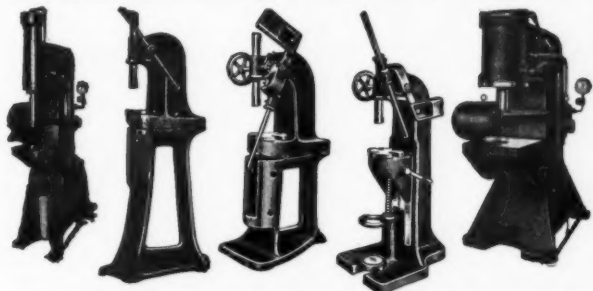
J. & S. TOOL CO.

477 MAIN ST.

E. ORANGE 2, N. J.



For ASSEMBLY, BROACHING, and BENDING



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65 Standard Styles and Sizes. Manually operated presses $\frac{1}{4}$ to 35 tons pressure.
Motor driven hydraulic presses $1\frac{1}{2}$ to 30 tons pressure.

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GREENERD ARBOR PRESSES

NASHUA

EST. 1883

NEW HAMPSHIRE

sion is the extra large tungsten carbide tip on the blades.

According to the makers the forged steel body is of rugged and massive proportions, yet generous chip clearance is provided. The deeply set blades are backed with a large volume of solid steel. This rigid construction, plus the Lovejoy "positive-locking" device, enables blades to withstand heavy or intermittent cuts without loosening or breakage. For fly cutting, several blades can be removed without affecting housing strength.

Both positive and negative rake Type "F" cutters are carried as standard items, in face widths from 7/16 to 1 1/2", the diameters being 5" to 18". The cutters may also be furnished equipped with either high speed steel or cast alloy blades. In addition to manufacturing a wide variety of standard milling cutters, Lovejoy also designs and manufactures special cutters to suit customer's requirements. All standard and special cutters, including the new Type "F", use standard Lovejoy blades.

ELLSTROM MASTER BLOCKS

A new "Tool Makers" set of five Ellstrom Master gage blocks, unconditionaly guaranteed accurate to plus or minus



eight millionths of an inch, is being offered by the Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.

★

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ELIMINATION OF MOISTURE
FROM
COMPRESSED AIR LINES
GUARANTEED**

Fouled tools, frozen and corroded pipes and general inefficiency result from moisture in compressed air pipe lines.

Eliminate moisture the Murphy way. Each installation of the Hamilton Aftercooler System (built by Murphy) is **guaranteed** to eliminate moisture or your money will be refunded. No job too large... and none too small to receive our best attention.

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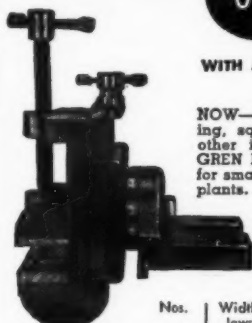
THE NEDCO COMPANY
WALTHAM MASS.

MILL IT
ON YOUR LATHE

PALMGREN

WITH A

MILLING ATTACHMENT



No. 250

NOW—you can do milling, slotting, grinding, grooving, squaring shafts, sawing at angles, and many other important operations on your lathe. PALMGREN MILLING ATTACHMENT is a necessary fixture for small shops, schools and emergency work in large plants. Fits South Bend, Atlas, Craftsman, Logan, Sheldon and all other makes. It has 360° graduation for rotary angle adjustments, also graduated feed and adjustment screw. Easily mounted by straddling lathe's regular tool post. Try one—it will quickly pay for itself.

IMMEDIATE DELIVERY

Nos.	Width	Depth	Jaws	Weight	Base	F.O.B.
	Jaws	Jaws	Open	Pounds	Opening	Factory
150	1½"	1"	1½"	6½	1"	\$18.75
250	2½"	1½"	2½"	11	1¼"	24.75
400	4"	1½"	4"	25	2"	39.75

Order from your dealer or jobber. Write for circular No. 350.

CHICAGO TOOL AND ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS for over 28 years
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ATLANTIC *makes fine* **GEARS**

ANY TYPE—Spur, helical, herringbone, bevel, worm, spiral

ANY SIZE—¼" to 60"

ANY MATERIAL—Cast iron, steel, brass, bronze, Micarta

ANY QUANTITY—One gear or volume production

We are equipped for prompt service on **SPECIAL GEARS AND BREAKDOWN JOBS**. Send us blueprints or gear samples for our quotations and delivery dates.

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A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{3}{16}$ " to 1" diameters. Send for pricelist.

HEIMANN MFG. CO.

332 Lincoln Ave.

Urbana, Ohio

This new combination is especially assembled for individual ownership by Tool Makers, Machinists, Apprentices and Hobbyists.

Available in .0625, .125, .250, .500 and 1", this smaller precision gage set will make 31 combinations in $1/16$ " steps up to 1-15/16". All gaging surfaces are chromium plated and each set is contained in a hand-rubbed walnut case.

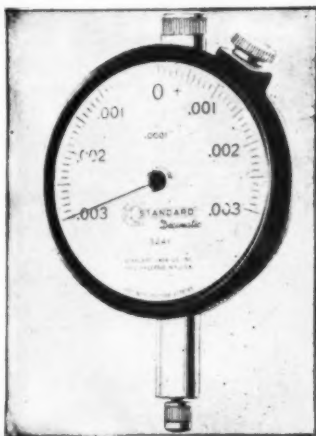
MATERIALS HANDLING DRIVES

Of interest to practically everyone engaged in the designing, purchasing or use of materials handling equipment is the 8-page 11 x 8 1/2" booklet entitled "Cone-Drive Gearing At Work In Materials Handling" (Bulletin No. 742) now available from Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

"Action" photographs, combined with explanatory diagrammatic sketches, illustrate the considerable variety of equipment for materials handling in which Cone-Drive double enveloping gearing is now being used to advantage. In each instance, the illustration also indicates just how the gearing has been engineered into the particular job in order to obtain maximum operating benefits from the installation. Included are cranes; hoists; capstans; winches; lift trucks; electric shovels; coal cutters; etc.

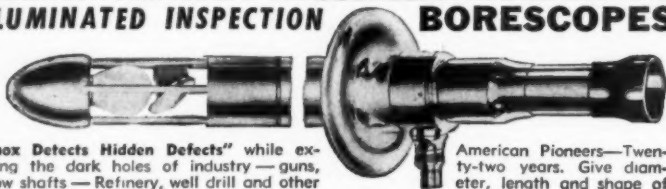
DECIMATIC INDICATORS

For fine tolerance checking, the Decimatic series of indicators has been introduced by the Standard Gage Co., Inc., Poughkeepsie, N. Y. These indicators are



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BORESCOPIES



"Lenox Detects Hidden Defects" while exploring the dark holes of industry—guns, hollow shafts—Refinery, well drill and other tubing, irregular dark spaces.

American Pioneers—Twenty-two years. Give diameter, length and shape of cavity.

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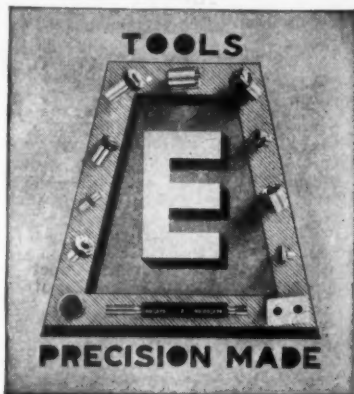
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A.S.A. STANDARD types and sizes in stock for immediate delivery.

Excellent delivery on NEW GAGES and GAGES salvaged by HARD CHROMIUM PLATING.

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MILWAUKEE 14, WISCONSIN

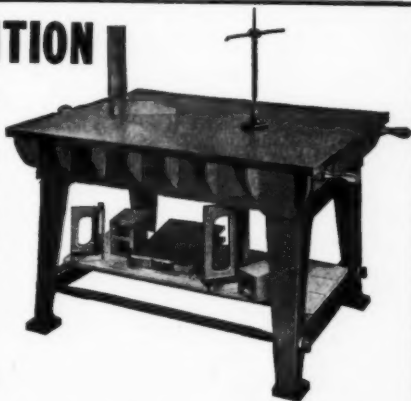


A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. Write today for full information.



J. C. BUSCH COMPANY

165 SO. BARCLAY ST.

ENGINEERS AND MACHINISTS
SINCE 1907

MILWAUKEE 4, WIS.

characterized by having dial markings in decimals, directly comparable to blueprint tolerances. Important mechanical and practical features are also presented.

Working advantages include the modified range, from approximately "20 minutes of" to "20 minutes past" on the dial. This range, while adequate for all but coarse tolerance checking, eliminates possibility of failure to notice a complete revolution of the hand. Also, these instruments are free from noticeable whip and waver of the hand with consequent reduced nervous strain on the operator.

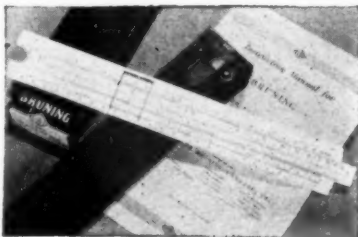
Consistent repeatability of an unusually high order and especially high accuracy are claimed by the manufacturer for these indicators. The instruments operate under exceptionally low tension.

Mounting dimensions are in accordance with American Gage Design standards and consequently Decimatic Models may be used in fixtures made to receive AGD indicators. The Decimatics depart from AGD specifications only in range and in the manner of marking the dial.

The Decimatic series of indicators comprises 19 different models with a variety of graduation values in both English and metric units.

BRUNING PLASTIC SLIDE RULE

To fill the need for a slide rule of greater dimensional stability, the Charles Bruning Co., 4742-44 Montrose Ave., Chicago, 41, Ill., has introduced a new 10" Slide Rule.



It is made of a plastic material that is said to have remarkable dimensional stability. The precision graduations are not affected by temperature change. The glass indicator is mounted in a polished stainless steel frame that holds it firmly in place.

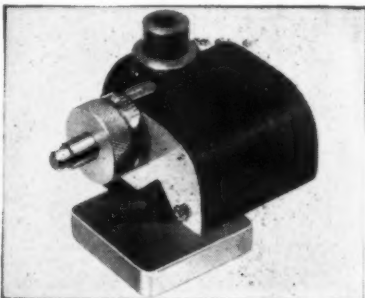


Immediate Delivery!

Standard Size Dowel Pins from $\frac{1}{8}$ " to 1" diameter and from $\frac{3}{8}$ " to 6" length supplied in .0002 and .001 over basic sizes. Unless otherwise specified, .0002 oversize will be furnished.

SCHULTZ & ANDERSON CO.

109 Edison Place, Newark 5, N. J.



MICROMETER LATHE STOPS AT REDUCED PRICES

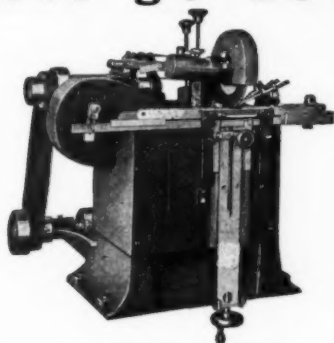
The Micrometer Lathe Stop is the last word in precision lathe working tools. Not large and cumbersome, but small, compact and rigid, with exceptional accuracy made possible by our construction. The handy knurled knob is graduated into 50 divisions giving a reading in thousands of an inch. Enables you to do precision lathe work and tool room jobs with your present equipment.

SMALL SIZE: For Logan, Clawson, and South Bend Lathes\$10.50
LARGE SIZE: For 12", 14", 16", 18", 20" and 22"\$15.00

Mail your orders today!

B. A. TAYLOR COMPANY
11706 Woodward Ave. Detroit 3, Mich.

Saw blade replacement costs go down



Time and again the E.C. all purpose metal cutting hack, band and circular saw grinder has paid for itself within a year following its installation.

Not only do blades last longer but experience has shown that when a tooth is ground with the E.C. combination grinder, it will take a maximum bite with minimum destructive effect on tooth. Down time is cut to a minimum. Write for E.C. bulletin.

THE **WARDWELL MANUFACTURING CO.**
3165 Fulton Rd., Cleveland 9, Ohio

Model 25 Hi-Duty
Marking Machine



MARK YOUR PARTS

Permanently

PART NUMBERS
HEAT NUMBERS

CATALOG NUMBERS
SERIAL NUMBERS

PATENT NUMBERS

MANUFACTURER — INSTRUCTION DATA — INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

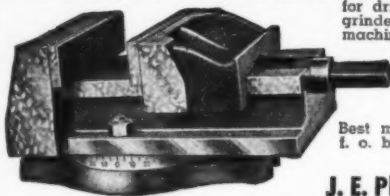


MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME

Send for complete catalog of our full line
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GEO. T. SCHMIDT, Inc.
1802 W. Belle Plaine Ave. Chicago 13, Ill.

PLUNKET IMPROVED VISES



We make a complete line of modern vises for drill presses, shapers, milling machines and grinders. Illustration shows our standard milling machine vise as regularly furnished and stocked.

In ordering this vise give size of slot in table:

No. 10—6" jaws, 1½" deep, opens 5",
wt. 45 lbs. \$38.00

No. 20—10" jaws, 2¼" deep, opens 8½",
wt. 120 lbs. 52.00

Best material and workmanship. Prices are net f. o. b. Chicago. Dealers' inquiries are solicited.

Write for folder TODAY.

J. E. Plunket Machine Co., 1823 W. LAKE ST.
CHICAGO 12, ILL.

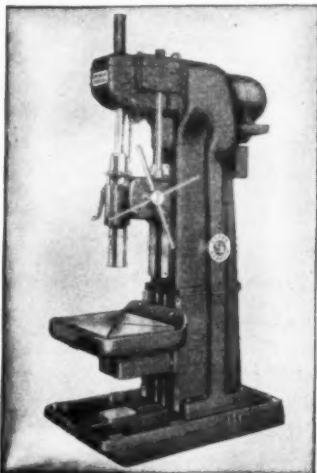
Graduations are precise and will not lose visibility thru use. The CI scale shows numerals and gradations in red to provide ease of reading. To permit the widest possible range of service, A, B, CI, C, D, K, S, L and T scales are shown on the rule. The beveled edges of the rule are graduated in inches and centimeters.

The Rule is smooth working for fast and easy operation. Because of its all-plastic construction, binding or sticking of the slide under varying atmospheric conditions is eliminated. The tension on the slide is easily adjusted by four screws on back of rule. The indicator glass may be readily replaced in the event of breakage.

This 10" Slide Rule is similar in construction to the popular 5" Pocket model introduced last year. Furnished with durable protective carrying case and simplified instruction book.

HIGH PRODUCTION UPRIGHT DRILL

A new line of upright drilling machines is announced by the Cincinnati Bickford Tool Co., Oakley, Cincinnati 9, O. Designed especially for high production industries, these machines are said to have the flexibility of general purpose machines with the simplicity of mass production tools.



Built in 21, 24 and 28" sizes, they have driving motors from 3 to 10 hp. Motor speeds usually are 1200 rpm unless lower

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HARDWARE DIVISION

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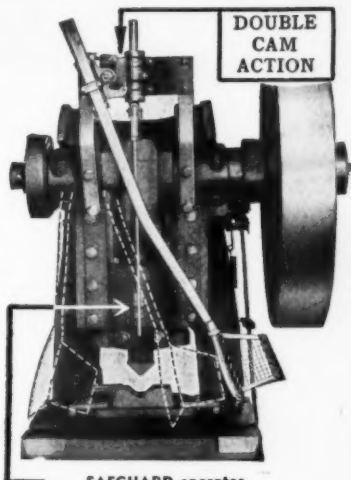
Save hands with Strand's SWEEP SAFGUARDS

With the Strand Sweep double cam action, you obtain proper sweep movement that prevents accidents. Operation of Safeguard from press head provides additional safety in case of screw or other breakage.

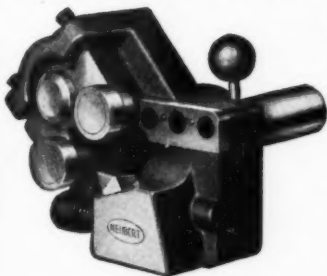
*Send for Circulars on Strand
Sweep and Enclosure Safeguards*

STRAND MFG. CO.

Safety Engineers
607 W. Lake St. Chicago 6, Ill.



THE NEUBERT BAR TURNER



1"

Write for circular.

IS THE BEST TIME SAVING TOOL USED ON TURRET LATHES AND SCREW MACHINES SET UP FOR BAR WORK. REMOVES LARGE AMOUNTS OF METAL QUICKLY AND PRODUCES WORK THAT IS SMOOTH AND ACCURATE.

CUT YOUR PRODUCTION COSTS WITH ROLLER TURNERS.

Immediate delivery

$\frac{1}{8}$ to $\frac{3}{8}$ " capacity, $\frac{3}{8}$ " shank.....	\$ 68.00
$\frac{3}{8}$ to 1" capacity, 1" shank.....	85.00
$\frac{1}{2}$ to 1" capacity, flange type.....	85.00
$\frac{3}{4}$ to $1\frac{1}{4}$ " capacity, flange type.....	110.00

NEUBERT MACHINE COMPANY

Precision Cutting Tools 341 W. Willow, Long Beach 6, Calif.

or higher spindle speeds provided by 900 or 1800 rpm motor, are required. The motors have magnetic reversing starters unless no tapping or spindle reverse is contemplated. Push buttons for controlling driving motor are lever operated and built in as integral parts.

It is possible to obtain 16 speeds and 8 feeds in relatively short time, and without costly major changes. Cover at top of machine is removed and the numbered pick-off gears are rearranged on the lettered shafts to provide the required speeds or feeds according to the direct reading etched plate mounted at back of gear case.

Adjustable automatic tapping reverse arrangement for production tapping is available. Tap leads when supplied will be of the gear drive type, providing an accurate lead to guide tap. A direct reading graduated scale facilitates drilling to the exact depth within .005". When extreme precision to within .001" is required in facing operations, a special "Dwell" attachment can be supplied.

Spindle and sleeve are carefully counterbalanced for easy operation by an easily accessible weight inside the column. Standard counter-weights are in one piece. When drill heads are to be

used, removable section weights are furnished to facilitate balancing of the various drill heads.

These machines are especially adapted for the use of medium and large size drill heads due to this provision for balancing; because of the rigid support provided by use of a flanged quill spindle, and the fact that ample power (up to 10 hp) is available.

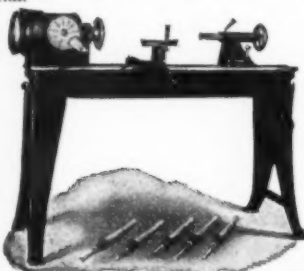
For maximum output on certain materials, coolant must be used and a cutting lubricant system is available. Also a chip hopper may be included to facilitate chip disposal and cutting lubricant conservation.

When frequent table height changes are anticipated the position type table is omitted and an adjustable type table with hand crank screw support is furnished.

The illustration shows the Super Service Direct Drive in its simplified construction. It could be further simplified by omission of the power feed or its range of operation could be expanded by including some or all of the features explained. These machines are also built in 2, 3, or 4-spindle gang drill construction. Booklet U-27 gives full particulars.

OLIVER METAL SPINNING LATHE

This sturdy lathe features a rigid heavy bed assuring accuracy in metal spinning. Heavy duty bearings in head-stock will stand tremendous pressures. Ball bearing, motor-driven headstock is adjustable for speeds from 800 to 2400 rpm. Live tail center is provided, available in 4 sizes. These lathes are also excellent for wood and metal turning. Let us send illustrated bulletin.



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THREAD GRINDING

**Also Internal, External
and surface grinding.**

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BEVEL**

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THE "FORM-MASTER"

ANGLE & RADIUS DRESSER

A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — \$150.00 complete.

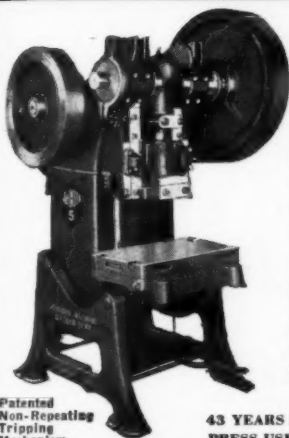
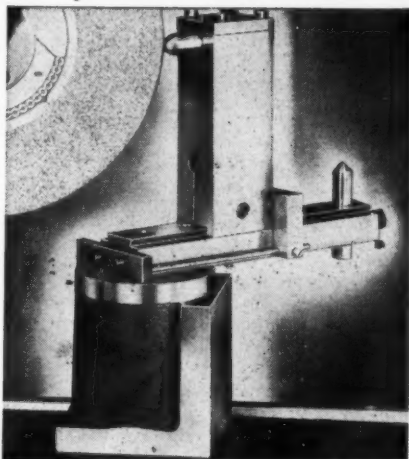
Features

Large range.
Chatterless and dustproof.
.0001" accuracy obtainable.
Simple to operate.
Reasonably priced.

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Patented
Non-Repeating
Tripping
Mechanism

UNLIMITED PEAK PRODUCTION

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

If you want the best, send for illustrated catalog describing complete line TODAY.



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JOHNSON MACHINE AND PRESS CORP.,

ELKHART,
INDIANA

CLEVELAND STEELWELD SHEARS

The Heavy Machinery Division of the Cleveland Crane & Engineering Co., Wickliffe, O., is introducing a new line of power-driven metal-cutting shears. To be known as Cleveland Steelweld Shears, the new machines are said to employ a revolutionary pivoted-blade principle.

There are no slides or guides to wear out of true. The upper blade operates on two heavy pivot pins secured to the end housings and travels in a circular path.

Turning a hand crank, conveniently located on right end housing, changes gap between the knives. A large dial indicates the clearance in thousandths of an inch and also shows plate thickness that may be cut for any knife setting.

Steelweld Shears may be arranged for squaring, slitting or notching, and firmly



locked. This feature is included on all machines with standard 24" deep throats, but is not furnished on the smallest size, where the throat depth is 18".

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Centers*

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live centers*

Adapted
for heavy
duty work.
Precision type
ball and roller
bearings assure
maximum capac-
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production and long
service.

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SIMILAR EQUIPMENT
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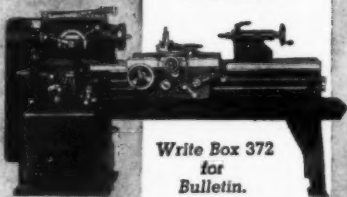
PRECISION SERVICE CORPORATION

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CLEVELAND 3, OHIO
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**CARROLL
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LATHES
15" AND 16"**

12 Speed Geared
Head Motor Drive
Timken Mounted
Spindle.

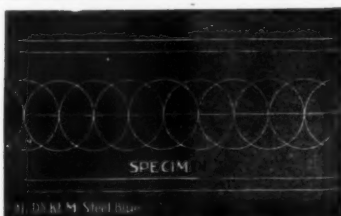
Modern Design—
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Bulletin.

**THE CARROLL & JAMIESON
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WATKINS - OHIO U.S.A.



**DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates**

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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| 5. Cerrolow—117 | Melting Temp. 117° F. |
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Both frame and blade are of all-welded steel, one piece construction. Because knife adjustment is made by movement of upper blade, there is no need of moving the bed, as is customary with most shears. Consequently, beds are welded integral with frames. Likewise, the large crown is welded to both end housings. This method of welding all parts of the assembly into a single integral unit provides maximum strength with minimum deflection.

Other features include heavy spring-operated mechanical hold-downs, which hold the plates firmly during shearing and automatically clamp thick plates with higher pressure than thin plates. An easy operating back gauge mounted on ball bearings is provided. Operating crank and dials of the gauge are located at outside front corner of the shear. The shear angle or rake is unusually low, thereby minimizing end thrust on the plate and reducing twist, camber and bow in the cut pieces.

Safety was given full consideration in the design of Steelweld Shears; protective features are provided to eliminate hazards as completely as possible.

Steelweld Shears have been developed in various sizes for cutting plate of all thicknesses from 12 gauge to 1¼" and for

lengths from 6 ft to 16 ft. Speeds range from 60 strokes per minute on the smaller shears to 25 strokes per minute on the largest size.

The machine illustrated is Model No. 610 and cuts plate up to ¾" thick by 10 ft wide.

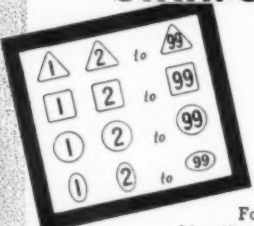
MINIATURE BEARINGS

A new catalog on R.M.B. Miniature Ball Bearings, is announced by Landis & Gyr, Inc., 104 Fifth Ave., New York 11, N. Y.

Outside diameters range down to 1.1 mm. (0.043").

Particularly attention is called to the "R" and "E" precision series, which represent recent developments and are made to dimensions and tolerances laid down by the International Standardization Ass'n. A wide choice of 200 types and sizes enables the user to select the right bearing for every need. Some series are of high precision quality, while others are designed and priced to encourage their use in large quantity applications. Included are certain new types of radial bearings that have never been available before.

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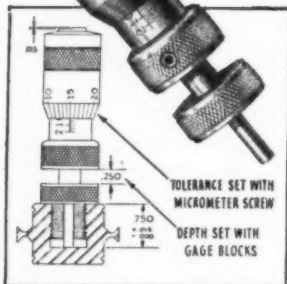
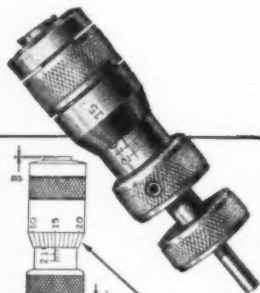
ADJUSTABLE FLUSH PIN GAGE

A new inspection tool, an adjustable flush pin gage, has been devised by engineers of Schnacke Mfg. Corp., Evansville, Ind. This instrument is capable of gaging depths to 3" basic and to toler-

ances of plus or minus .000" to .200" in steps of .001".

The main body of the gage consists of a micrometer thimble and sleeve calibrated from 0 to .200". Extensible from the body is a sliding anvil member terminating in a knurled base, the underside of which is the gaging or anvil surface, which is positioned on the workpiece being gaged.

It is said to be a fast-working gage. Holes of a maximum depth of 3" plus .200" can be gaged by means of the interchangeability of three gaging pins. The gaging pins or rods as furnished are nominally of $3/16$ " diameter.



HANDBOOK OF STAINLESS STEEL

A 100-page pocket-size ($5 \times 7\frac{1}{2} \times \frac{1}{4}$ ") handbook presenting practical information on 26 types of stainless steels has been published by Allegheny Ludlum Steel Corp., Brackenridge, Pa. It brings up to date, supersedes and amplifies the stainless steel chapters of the earlier "Handbook of Special Steels" and includes most of the data and information that is available on file-size "Blue Sheets" for the various types of stainless steel.

The handbook contains a 44-column finder chart giving analyses, properties, hot working temperatures and heat treat-



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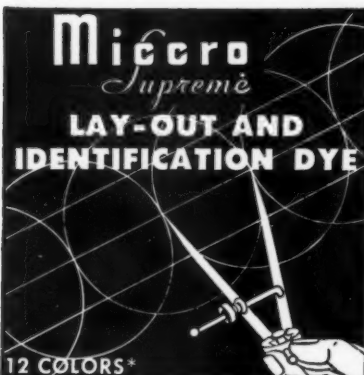


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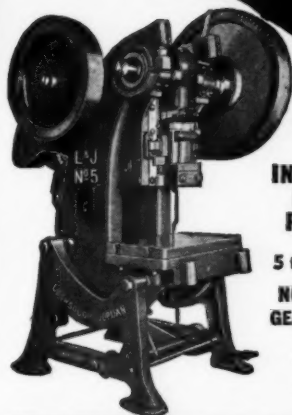
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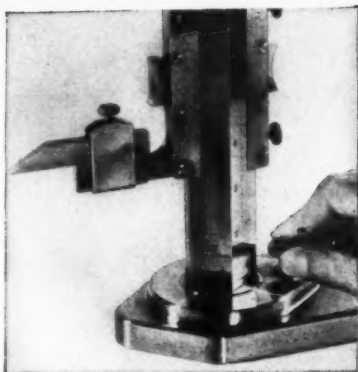
ment of the different types and a general discussion of types and properties of stainless. This is followed by a table of corrosion resistance of four leading types of stainless to 230 chemicals and common materials.

Fabrication methods and procedures, occupying 40 pages, describe welding methods; press forming, drawing and blanking; machining techniques; spinning qualities, tools and methods; upsetting and forging; riveting, shearing, soft soldering, annealing and heat treating, grinding, polishing and buffing, and surface treatments, including removal of welding flux, degreasing, sandblasting, pickling, and passivating.

Stainless steel products, including plates, sheet, strip, bars, forging billets, tube stock and tubes, angles, wire, castings forgings, and clad steel (Pluramelt) are described in a 20-page section. Final pages contain general tables of bar weights, weights of sheet, weights of tubes, feet per pound of wire, decimal equivalents of fractions of an inch, and temperature conversion.

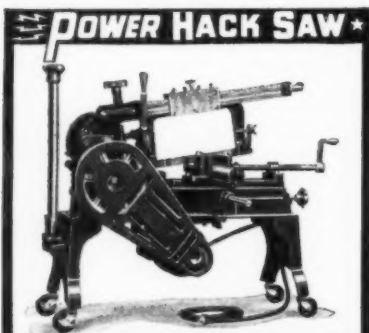
CHESTERMAN HEIGHT GAGES

George Scherr announces a new 48" Chesterman Height Gage for precision in-



spection, layout, scribing and checking of large size jigs, fixtures, dies and castings.

It is an extremely sturdy, well-constructed height gage. It employs an extra large vernier measuring 2.450" long, as compared to the $\frac{1}{16}$ " vernier commonly used on conventional height gages. Thus, the verniers which read to 1/1000" on the

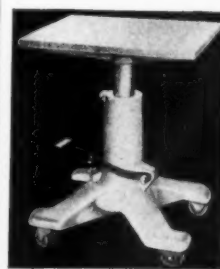


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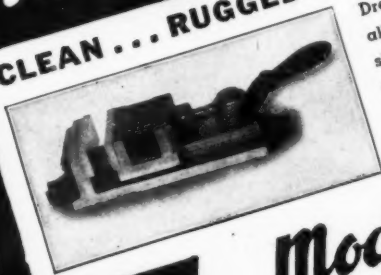
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Modern Tools
BERLIN, CONNECTICUT

English scale and to 1/50th of a millimeter on the metric scale, may be quickly read without necessity of removing gage from the work and holding it up to the eye, employing magnifiers. It is claimed that this extra long vernier enables the tool-maker to produce consistently more accurate work.

Graduations are made on a heavy triangular beam and quick adjustment is obtained simply by pressing two lugs. The fine adjustment, which appears in the base as illustrated, is an outstanding feature since in making adjustments, downward pressure on the screw instead of causing tilting and unintentional moving of the height gage, as may occur with ordinary gages, helps in holding the tool even more firmly to a surface plate.

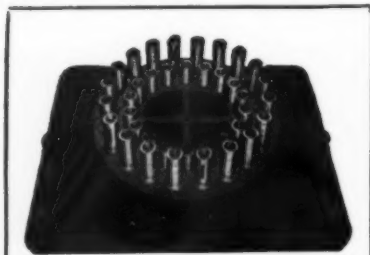
The gage is hardened and ground all over and has extremely accurate graduations. In addition to the new 48" size, the gage is manufactured in 12, 18, 24 and 40" sizes provided with both English and metric scales.

The George Scherr Co., 198 Lafayette St., New York 12, N. Y. offers a 6-page folder presenting the advantages of the Chesterman Height Gage. In addition to the gage itself, a master gage block for checking vernier setting and a depth

rod for taking depth measurements are also provided.

"AIRSNAP" FIXTURES

New standard adjustable "Airsnap" fixtures for use with Precisionaire instruments have been announced by The



Pictured: a 38-Spindle Heavy-Duty Drill Head.

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The Macmillan Co., 60 5th Ave., New York 11

Sheffield Corp., Dayton, Ohio. These adjustable Airsnaps provide desirable flexibility in checking external dimensions by air and are available in eight models covering a range of from .250 to 2.000" inclusive. Larger sizes may also be had on special order. Maximum diameter of the part to be checked determines the size range and model.

Standard adjustable Airsnaps can be used with Sheffield Precisionaires on dimensions with tolerances ranging downward from .002". Special adjustable Airsnaps may be used for checking to tolerances of .0002" down to ten-millionths or less.

The adjustable anvil may be located at any point within a $\frac{1}{4}$ " range. It is mounted so that its gaging surface is always parallel to that of the fixed anvil. The backstop is adjustable along an angular way so that when in contact with the extensions of the adjustable anvil, it is square with the anvil gaging surfaces and in proper position to automatically line up axis of the part with center of the two air jets. The oversize setting enables utilization of the full manufacturing tolerance of the part in gaging and allows the proper amount of air to flow so as to obtain a correct read-

ing. Because of tungsten carbide surfaces, wear on gaging anvils is reduced to a minimum, prolonging their life. Each adjustable Airsnap has built-in balanced airflow accuracy so the reading does not change if one anvil is closer to the part than the other.

The adjustable Airsnap, used with the Sheffield Precisionaire, has a wide range of applications for checking external dimensions of work in or at machine or at the bench. It is also used on work which is too large or too unwieldy to be presented to the gage and for checking close to a shoulder. Highly finished or soft-plated parts can be checked with minimum possibility of marring or scratching, and thin-walled cylinders can be checked on the O. D. without danger of collapsing.

AMPCO PRODUCT BULLETIN

Ampco Metal, Inc., Milwaukee 4, Wis., has issued Bulletin 72, highlighting the Ampco line of alloys, specialties and services.

For many years Ampco has been nationally known for its sand and centrifugal castings, but some were not familiar with additional products and serv-

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No. 1-A MILLER
Catalogue B-90 illustrating and describing various types of drilling, milling, reaming and boring machines is available on request.

DAVIS & THOMPSON CO.
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ices which have been developed recently. The new bulletin discloses that the activities of the company have been broadened so that today it offers many specialties, such as resistance welding electrodes, mill products, continuous cast bearing bronzes, Ampco clad metals, pumps, and fabricated assemblies. The lines of non-sparking safety tools and arc welding electrodes have been enlarged. Facilities for precision machining, which were emphasized during the war when the company finish machined aircraft parts to extremely close tolerances, are also maintained and this service continues as an important facility.

STELLITE PLUG GAGES

A study has been made recently by the Cadillac Gage Co., 20316 Hoover Road Detroit 5, on the length of service rendered by the company's Stellite thread plug gages in the plants of armament manufacturers in the gaging of precision parts made of materials varying in their abrasive qualities. This study is said to reveal that Stellite gages have consistently given five to 20 times longer service than the steel gages previously used.

Developed by Cadillac and tested over a period of three years, the Cadillac

Stellite Plug Gage, it is claimed, actually reduces gage costs 50% to 85%. Because of its demonstrated economy, a major automotive manufacturer is reported to be changing over its plant to the use of Stellite plug gages exclusively.

The fact that Stellite is an alloy of cobalt, chromium and tungsten, gives it superior properties as a material for inspection tools.

Having a lower coefficient of friction, it resists wear more effectively than steel. And, being acid-proof and corrosion-proof, its accuracy is never impaired by moisture or other corrosive agents.

It is also non-magnetic and has an exceptionally low affinity for other materials. Consequently, it makes for easier manipulation in gaging and obviates any tendency of the gage to seize—formerly a common occurrence when steel gages above 1½" in major diameter were used for certain types of gaging.

Cadillac has recently increased its production facilities to include all standard sizes of Stellite thread plug gages from No. 6 to 15" in diameter—also special pitch diameters according to customers' specifications. The company also manufactures a complete range of sizes in steel thread plug and thread ring gages.

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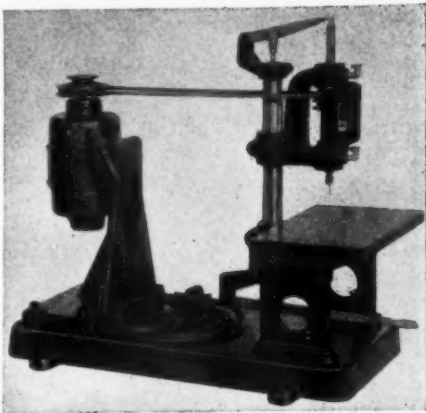
The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

MASSASOIT OFFERS NEW SENSITIVE DRILL

A new, improved design of its Lord & Davis Supersensitive High Speed Drill Press for drilling small diameter holes is announced by Massasoit Machine Corp., of 224 Grove St., Waltham 54, Mass.

Speed of the new model has been increased from 23,000 to 25,000 rpm. A back shaft and idler pulley have been eliminated so that there are fewer moving parts. A lighter chuck with internal taper hole, as well as a spring which raises spindle, are used to make operation of the machine more sensitive. More needle bearings are now used in spindle to increase accuracy.

Main feature of the drill press stressed by the makers is supersensitive operation. A floating spindle, driven by a lightweight woven endless round cotton belt, is operated by a supersensitive feed control lever so that drill may be fed with only an ounce of pressure. Leverage is computed so that operator can easily apply correct amount of pres-



sure to the drill and the machine is so sensitive that operator can always know the cutting action of drill. Consequently,

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NO MORE "C" WASHERS, WRENCHES, DRAWBARS, NO MORE ARCS OR TAPERS BEFORE OR AFTER EXPANSION GRIP — CONCENTRICITY IN LOW 10,000ths — PRODUCTION OR INSPECTION.

Assured parallelism of sleeve surface to center line — absolutely no variation in repeated mounting of parts. Uniform full-work-length friction-locking gives complete control and contact of entire bore surface area — Absolutely no variation in repeated mounting of parts — no tapers — Slip part on mandrel with slight counterclockwise motion, that's all — it's ready — Self-contained, self-expansion, self-locking, self-contraction. Instant unloading, no jamming, no adjusting — Interchangeable sleeves — you do not obsolete Young Mandrels. — Built to your bore tolerance high limit, with automatic contraction to low limit — Any mounting — Any machine operation — For bore diameters .718 to 5.5 — Reduces tool costs, extra equipment investment, operating costs, maintenance, down time, scrap, salvage.

YOUNG ARBOR COMPANY, 3257 Bradford Rd., Cleveland Heights 18, Ohio

drill breakage and work spoilage are reduced to a minimum and easy operation cuts down operator fatigue and steps up production; maximum accuracy of holes is assured.

The newly redesigned drill press requires only 18"x12" bench space and measures 15 1/4" in overall height. Size of work table is 8"x47 1/8" and maximum feed of drill is 3/4". A 1/5 hp universal motor with a speed of approximately 16,000 rpm is used to give four standard speeds of 7,600, 11,500, 17,400 and 25,000 rpm. Different speeds are obtainable by changing drive pulley size. If greater versatility is required, a rheostat may be used.

This improved drill press is of special interest to instrument makers and industrial manufacturers whose products require accurately drilled holes in sizes from .004" to 1/16". The machine offers efficient, economical drilling of holes with maximum accuracy on a production basis.

VARIABLE GAP DEMAGNETIZER

In order to completely demagnetize work, it must come in contact with a powerful a-c field and then pass into respective weaker fields until the flux density approaches zero as a limit. The

maximum flux density can only be obtained when the gap thru which the work passes approximates the size of the work. This places the work in close proximity to the fields, thereby eliminating losses.

Prior to the new design it was believed that this a-c field should be one field and the work pass thru a broken section of the iron circuit. To make an adjustable gap use this fundamental principle would require the mechanics of sliding the iron field for various gaps. This is a complicated mechanical proposition.

Experience has proven that several fields out of phase with each other will produce a more effective demagnetizing effect than a large constant a-c field. To use a homely illustration, four men standing at the corner of a rug all shaking in unison will not remove dirt as readily as four men at the corners shaking out of step and the rug being subjected to a non-uniform motion.

Demagnetization is upsetting the uniformity of a magnetic field. Therefore, the more out of phase the fields are, the better the job is accomplished.

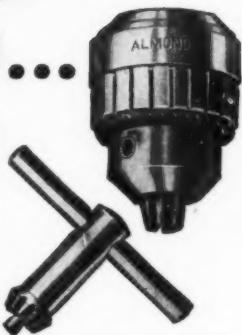
By CHARLES D. BRIGGS

O. S. Walker Co., Worcester, Mass.

ALMOND... *Triple Jaw* DRILL CHUCK

The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole — to fit all machine tools and portable tools.



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**The Original
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of Drill Chucks**

T. R. ALMOND CO.

ASHBURNHAM,

MASS., U.S.A.

DoALL'S NEW HIGH SPEED METAL SAW

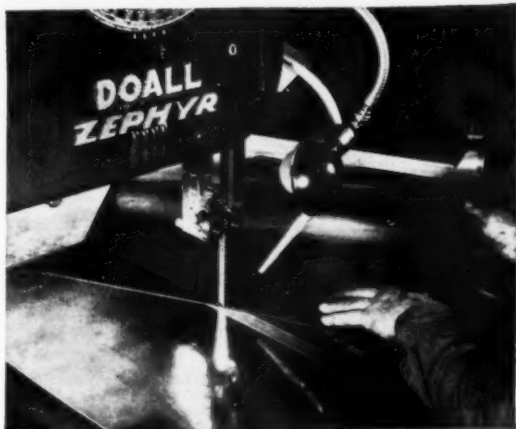
Announcing the Zephyr 16, DoALL adds another high speed metal cutting band saw to the line.

Designed primarily for light gage steel and foundry application, the Zephyr 16 is also applicable to woodworking and pattern shops, as well as on production lines where it is desired to cut material as fast as it can be fed into the saw.

This smaller version of the Zephyr 36 has a 16" throat depth and a 10" thickness capacity. Featuring the company's patented speed assembly, the machine has an infinitely variable speed range from 1000 to 5000 fpm.

The combination of controlled saw speed and the special DoAll saw blade permits fast cutting rates in sheet steel, aluminum, and ferrous and

non-ferrous castings as well as paper, wood, plastics, laminates, and composition materials. Steel springs and links,



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We are also manufacturers of A.C. generators, 500 watts to 125 K.W., rotary converters, motor generators, high frequency generators, etc.

Katolight engineers have developed a lot of know-how. Give us a chance on your special requirements.

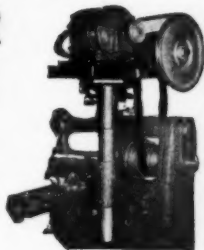
KATO ENGINEERING COMPANY

1415 First Ave.

Minnetonka, Minn.

MODERN... MOTOR DRIVE

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Shipment**



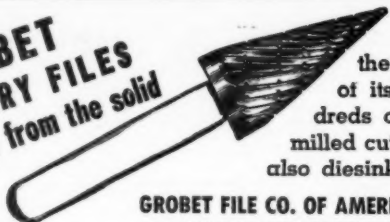
Save floor space, save power, and eliminate line shaft expense by installing MODERN MOTOR DRIVES in your plant. All drives are ball-bearing equipped and designed to fit practically every machine tool. Soundly engineered for long life.

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GROBET ROTARY FILES ground from the solid



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the most complete catalog
of its kind, illustrating hun-
dreds of rotary files hand cut,
milled cut, ground from the solid;
also diesinkers' burs.

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PLANTS: NEW YORK • CHICAGO • LOS ANGELES

flexible steel tubing, laminated rubber and steel, or aluminum and wood, combinations of steel and copper, steel and rubber tubing or porcelain steel can all be sawed on the Zephyr 16 with speed and good finish.

As compared to conventional metal sawing rates of one square inch per minute in steel and four square inches in cast iron, the new saw slices thru $\frac{1}{8}$ " stainless at 48.6 lineal inches per minute; 13 gage sheet steel at 150"; 75 ST aluminum at 100 square inches. Aluminum, bronze, brass, copper, zinc, gates and risers from iron castings cut about as fast as the material can be pushed into the teeth of the saw. Other materials cut correspondingly fast.

Table of the Zephyr 16 is of the tilting type, and there is a disc cutting attachment for making perfect circles, a rip fence, and a mitering attachment for cutting of regular and compound angles. Hardened steel saw guides with roller back-up bearing hold the blade firm for straight true cuts to close tolerance.

Full information is contained in the Zephyr catalog obtainable The DoAll Co., 1301 Washington Ave., So., Minneapolis 4, Minn.

GEAR FINISHER BULLETIN

An improved Model 900 rack type gear finishing machine, which operates on the well-known "Michigan" crossed-axis gear shaving principle, is described in technical bulletin No. 900-44, now obtainable from Michigan Tool Co., 7171 E. McNichols Road, Detroit 12. The improved 900—said to produce precision gears in mass production at the lowest cost for any gear finishing process—will handle either spur or helical gears from one to 8" pitch diameter, and up to 2" face width. It is also used for finishing involute splines, etc.

Use of the basic rack for finishing gears is reported to assure minimum errors in concentricity, uniformity, spacing and tooth profiles. The normal or base pitch is always correct with this type of machine, it is stated. Operation of the 900 model is so simple that unskilled and semi-skilled help—including women—can be trained to operate machine in a short time. Complete specifications, together with a list of standard and special items, are included in this bulletin.

KNURL it Easily, Quickly, Safely

Use any Standard Knurls $\frac{3}{16}$ " x $\frac{1}{4}$ "



Two Sizes:
 $\frac{1}{16}$ " to 2"
2" to 4"

FOR LARGE OR SMALL LATHES



Priced
To Sell

TOOLMAKERS' PRECISION VISES

JOSEPH B. FAKES & COMPANY • ROYAL OAK, MICHIGAN

DUMORE BENCH DRILL

Furthering their steps in peacetime conversion, The Dumore Co., Racine, Wis., announces production of a lightweight, high speed Bench Drill for $\frac{1}{8}$ " drills and smaller.



It is designed particularly for use in the fabrication of small parts of metal, wood or plastic items and equipment.

Drill head is firmly held in the desired position on the polished solid steel column with a locking device. It rigidly holds the motor in place, yet permits vertical adjustments and a 360° radius of action. The table is mounted in like manner.

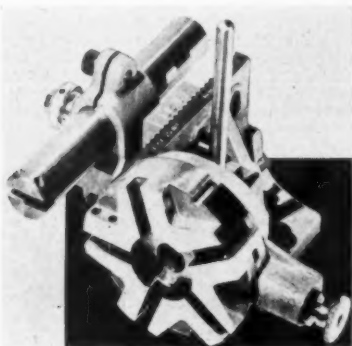
Drilling operation is accomplished by elevating table to the drill thru the use

of a hand control geared to table. This feature is an advantage in getting the proper workfeeding speed. Power is supplied by a $1/30$ hp motor with a range of 2,000 to 15,000 rpm. Speed is controlled by a foot rheostat, permitting free use of both hands.

The Drill weighs 15 pounds, which permits portability or permanent mounting to a bench, if desired.

TRUE-LINE TOOL-HOLDER

A new style vertical precision multi-tool holder permits 26 separate and distinct operations on a lathe. Time and motion studies are said to reveal that the accuracy, speed, and economy obtained actually result in up to 40% saving in machining costs.



Designed by True-Line, Inc., engineers, Milwaukee, Wis., the turret head holds five tools, permitting five or more operations to be accomplished in sequence. In addition, the holder is equipped with an

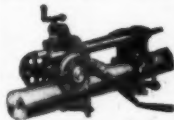
Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. — Inexpensive — last for years.

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**NIELSEN TOOL &
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1962 W. Eleven Mile Road,
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BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected — save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

outboard type of boring bar which permits simultaneous inside and outside machining. The center of the turret is a No. 3 Morse taper to accommodate a reamer or boring bar.

Not only can the standard operations such as facing, grooving, threading, turning, and chamfering, etc. be performed with the tool, but its versatility is further illustrated in machining both inside and outside at the same time, including cutting inside and outside tapers.

Another distinctive feature claimed for the tool holder is assurance of machining consistently accurate to within a tolerance of 2/10 of a thousandth.

It is related that during the war, a leading Milwaukee manufacturer found it impossible to keep pace with the increased demand for his product due to the limited applications of conventional types of tool holders. At present this particular manufacturer's plant is completely equipped with the True-Line Multi-Tool Holder, and his production is four times what it was with standard equipment, without any increase in cost or personnel.

YELLOW HEAD WHEEL DRESSERS

The Yellow Head grinding wheel dresser line is back on the market. For over twenty years this fine line of equipment has been helping manufacturers to increase production and decrease the cost of maintenance of grinding equipment.



Included in the line is the famous self-lubricated Yellow Head Dresser. The rotating parts of this dresser are lubricated by graphite, sucked from a magazine in the handle as the cutter and shaft rotate.

This line of "Yellow Head" dressers and cutters are now being manufactured by the City Machine Co., Piqua, Ohio.

ALUMCOTE FINISHES

The postwar Alumcote series of aluminum finishes incorporating the latest war-improved technical advances is now available for civilian production, according to an announcement by The Watson-Standard Co., Pittsburgh 12, Pa.

Alumcote protective coatings are available in nine types, each of which has been designed to meet specific requirements as to use and method of application. They are designed to provide smoother, more brilliant and more durable product finishes.

The lithographer, container manufacturer and metal fabricator will find the new aluminum finish for black plate to be of definite interest from the standpoint of tin conservation.

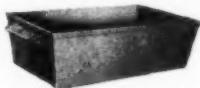
The reflector, stove and heater manufacturers will find the new heat-resistant Alumcote suitable for service at elevated temperatures.

Toy, drum and pail manufacturers will get smoother, tougher, more brilliant coatings formulated to withstand abrasion and severe handling.

Paper converters will find Alumcote suitable for producing brilliantly embossed, decorative and protective food packaging products.

Complete information will be furnished on request.

New Nesting Type Tote Pans



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.
BRIDGEPORT, CONN.

SCHMIDT SOLDERING and OPEN FLAME TORCHES

Use artificial or natural gas or gasoline. Start without generating—"soldering heat in less than a minute." Schmidt "CONCEALED FLAME" Soldering Torches hold coppers steadily at any desired heat for continuous work. Very economical.

A moderate investment in Schmidt Equipment will step up production, reduce costs and increase profits. Send for circular.

for all Soldering
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CONCEALED
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FLAME
TORCH



MINN-KOTA FOUNDRY & MFG. CO.
DEPT. 804 FARGO, NORTH DAKOTA

IMPROVED EYE SAVERS

An Improved Model 1-N Eye Saver is now made with a rugged molded plastic frame that is said to resist breakage, wear longer, provide better ventilation with reduced fogging.



This new all-molded frame is better looking, better fitting, plenty roomy and

comfortable for wear directly over many styles of prescription glasses. As with all Eye Savers, the new Model 1-N gives extra protection against injury from top, sides and bottom.

The tough, Impax methacrylate lens stops flying chips, splinters, splatters of hot metal. It exceeds Federal specifications for impact-resisting goggles, yet is as clear and free of distortion as the finest optical glass.

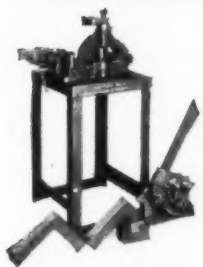
The new goggle is so light in weight, workers will keep them on. For further information, write Watchemoket Optical Co., Inc., Providence 3, R. I.

WADE ISSUES BULLETIN

An attractive new 12-page catalog, recently published by The Wade Tool Co., 51 River St., Waltham 59, Mass., covers their new No. 5 and No. 7 Hand Screw Machines.

Large illustrations show arrangement of all parts and details of headstock, quick-acting collet closer, drive, turret assembly, cross and swivel slides, multiple tool holder and an assortment of standard tools.

WHITNEY-JENSEN PRODUCTS 30 YEARS EXPERIENCE



No. 455
ANGLE
IRON
Combination

SHEARS - NOTCHES - BENDS

All size angles thru 2"x2"x1/4"

WRITE FOR LITERATURE

WHITNEY METAL TOOL COMPANY
1110 ROBESON ST. ROCKFORD, ILL.

Real Cleaning Power One - Man Portability with TORNADO



Portable Industrial
Vacuum Cleaner

QUICKLY picks up chips, dust or water. Cleans walls, beams, machines, floors, boiler tubes and tops, molds, etc. Powerful - portable. A real one-man unit. Weighs only 40 lbs. Dirt capacity 12 gals.



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Electric Mfg. Co.

5118 N. Ravenswood Ave., Chicago 40, Ill.



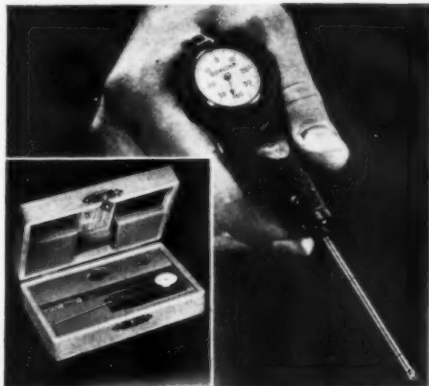
PORTABLE INDUSTRIAL VACUUM CLEANER
TORNADO

FEDERAL SMALL HOLE GAGES

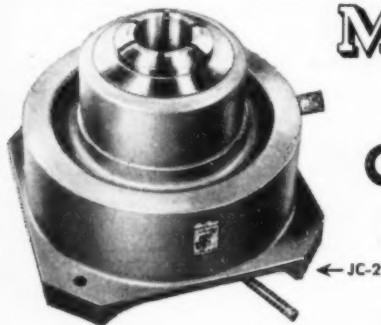
A Dial Indicator Gage for extremely small holes is offered by Federal Products Corp., 1144 Eddy St., Providence, R.I. It will gage holes as small as .122" and up to .250" ID. It will also gage these small holes up to depths as great as 2 1/4". Variations within the range .122" up to .250" are obtained by use of a set of 12 interchangeable gaging plugs.

This is the first time that holes of such small diameters as this have been gaged with a Dial Indicator type of gage. Formerly, conventional plug gages had to be used for gaging extremely small holes. With conventional plug gages it was not possible for the inspector to see the various eccentricities of the hole, such as taper, out-of-round, and bellmouth and other defects. The makers emphasize that with this new small hole gage, these internal defects are immediately recorded on the Indicator Dial.

While this Gage (Model 1203-P-1) is accurate and extremely sensitive to very



fine dimensional variations, it is also a sturdily built instrument, and does not call for skilled manipulation or the fine sense of touch of the highly skilled inspector.

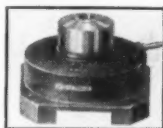


JC-2 holds bar stock up to 2 1/2" and with step chucks handles shallow circular shapes to 5". Used wet or dry. Coolant issuing through the collet lubricates, cools, washes away chips. The smaller models hold stock for heavy machinery operations, yet with a suitable pressure reducer, they will gently handle the most delicate precision parts as low as 1/16" diameter. Work

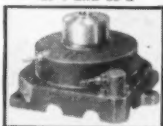
MEAD AIR COLLET FIXTURES

← JC-2 automatically ejected. Foot pedal frees operator's hands. These high production precision fixtures will help you produce more second operation work quicker, cheaper, better.

Write for complete MEAD AIR POWER CATALOG of pneumatic work - holding equipment.



LS-1 and LS-2



LS-3 and LS-4



Pygmy Collet

MEAD SPECIALTIES COMPANY

4114 North Knox Avenue, Dept. YA-56, Chicago 41, Illinois

The Gage is calibrated and set for any specified ID to reveal the condition of holes up to a total range of plus or minus .004". The minimum graduation is .0001". The Dial is balanced and can be rotated (0-4-0). The Sensitive Contact is a hardened steel ball, and the reference contact is a chrome plated plug body. The gage is furnished with extra balls of the specified size to fit the gaging plug.

The gage is regularly furnished for use as a single purpose gage. If new dimensions call for additional plug sizes, such plugs are readily adapted and calibrated to the instrument by using a micrometer caliper. Either a regular micrometer or an AGD ring gage is used as reference master for establishing and checking the Zero setting.

Two extra springs and a wrench are part of the set, which comes complete in a strong, compact, velvet-lined wooden case.

SHEFFIELD VISUAL GAGES

An attractive new catalog illustrating and describing Visual Gages is now being offered by The Sheffield Corp., Dayton 1, Ohio. It shows the various attachments which can be used with the Visual Gage, making possible a great number of different applications.

The Sheffield Visual Gage is an indicating comparator, with either English or metric scale, used for checking external and internal dimensions—width, thickness, height, depth, diameter, taper, out-of-round, concentricity, the angularity of surfaces or angularity between a bore and a surface, and run-out. It is also widely used for checking the critical elements of screw threads. Six models are available with magnifications ranging from 500 to 1 to 20,000 to 1. The wide range of amplifications provides a means for checking master and production gages, for toolroom work, for checking purchased parts on arrival, for process control and final inspection, and laboratory and research work.

THERMOCOUPLE DATA

Wheelco Instruments Co., Chicago 7, Ill., offers a new edition of its Thermocouple Data Book and Catalog. Containing 32 pages and designated Bulletin S2-6, it gives information on selection of proper thermocouples and carries installation aids. It describes and lists prices and recommendations on thermocouples, thermocouple wire, lead wire, heads, connectors, plug and socket assemblies, insulators, and protecting tubes.

Janette



SPEED REDUCERS

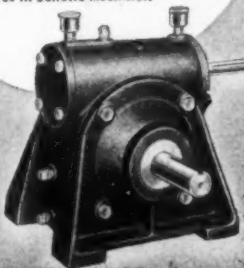
ONE SOURCE . . .

Motorized or Motorless

All motors, brakes, gears and speed reducers are built completely by Janette . . . there is no divided responsibility for their design, manufacture or successful operation.

A right angle countershaft reducer is advantageous for most installations, because less space is necessary. The worm, or combination worm and planetary gears, used in Janette reducers, make one of the most sturdy, compact gear drives available, when power transmitted and ratio of speed reduction are considered.

If you want either motorized or motorless speed reducers that are attractive in appearance, easy to install and maintain, efficient, quiet and reliable, you will find these features in Janette machines.

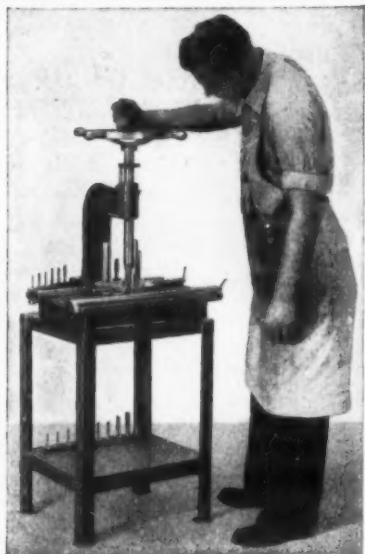


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1/30 to
7 1/2 H.P.
.08 to
447 R.P.M.
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Janette Manufacturing Company
556 W. Monroe St. Chicago 6, Ill.

Lassy TAPPER*

AND THREADER (Single Spindle)
SAVES TIME, TAPS, EXPENSIVE LABOR



Taps twice as many holes, quicker than with a tap wrench. Always right angle holes. Tap capacity $\frac{1}{8}$ " thru 1".



STEPPED HOLDING BARS. Replace Vise, hold work firmly — prevent tap-breaking torque.

TAP ADAPTERS. No extra spindles needed. Change taps in a jiffy.

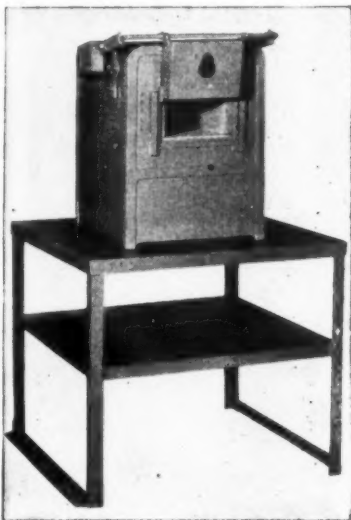
DEPTH GAUGE. Always shows depth tap has traveled.

Immediate Delivery
Write for Folder B2

LASSY TOOL COMPANY
PLAINVILLE, CONN. *Patents Pending

SMALL FURNACES

Two new optional features have been added to Cooley Muffle Type Electric Furnaces manufactured by Cooley Electric Mfg. Corp., Indianapolis, Ind. The standard furnace has hinged door which, when opened, forms a loading shelf. It is now offered in an alternate design incorporating a counter-weighted vertically operated door for particular use where only partial door opening is required.



Cooley Electric Furnaces have been supplied for industrial uses such as heat treating tools, dies and small parts, also for laboratory testing. They are manufactured in two standard sizes, the MH-3 with chamber dimensions of 8" wide x 6" high x 14" long, and the MH-4 with dimensions of 10" wide x 6" high x 18" long, for continuous operation at 1750° F or intermittent operation at 1850° F. The makers stress that due to unique features of fully protected heating elements which are removable and replaceable when necessary, these furnaces are particularly economical in operation. Heating time to 1400° F is only approximately 40 minutes, while heating time to 1850° F can be accomplished in 55 to 65 minutes. These furnaces are usually operated with an

Indicating Controlling Pyrometer. With this equipment, procedures may be accurately followed.

The furnaces may also be used for other operations, such as drawing, tempering, normalizing, annealing, pre-heating for high-speed hardening, emergency repairs, and experimental testing to establish heat treating procedures. They have proven to be time and money savers for heat treating small parts in the die room, making it unnecessary to send the parts out of the plant for heat treating. In addition, they have been used in production lines where it is necessary to heat small parts to facilitate assembly on the production assembly line.

The furnaces are also used as pilots for inexpensive checking of heat processing cycles prior to the actual running of larger loads in big furnaces. This is an inexpensive way of determining various cycles and procedures with specimens and actual parts.

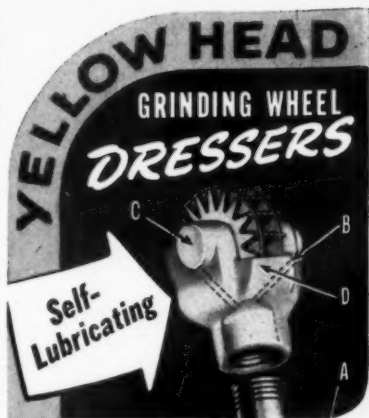
The second new feature is a heavy gauge structural steel stand of welded construction which is now being offered. It serves as a bench for the furnace, providing a shelf for storage space beneath the ample table top area. This stand establishes the furnace at the proper working height with furnace hearth 42" above floor.

YOUNG PRECISION MANDREL

Of interest to tool and machine shops, production and inspection departments is the new "Young" Precision Mandrel with "Roller Clutch Expansion".

Work placed on the mandrel is locked in place automatically, ready for cutting tool, grinding wheel, deburring or polishing operations. "C" washers, wrenches, or drawbars are unnecessary. When extreme cutting pressure is encountered, this merely results in tighter holding of the work. Material worked under heavy pressure releases just as easily and quickly as under a deburring operation. No auxiliary power is required to expand a "Young Mandrel". The makers say it cannot be sprung or damaged under normal uses. It is ruggedly constructed, has interchangeable sleeves and will maintain concentricity in the low ten-thousandths for the entire length of the workpiece; since no arcs or tapers are involved or developed before or after the work is loaded.

An illustrated folder giving complete details is available from the manufacturer; Young Arbor Co., Dept. L, 3257 Bradford Road, Cleveland Heights 18, Ohio.



Increases cutting speed of grinder wheels, decreases cost of maintenance of the dresser . . . that's what YELLOW HEAD "Self-Lubricating" Dressers will do for you.

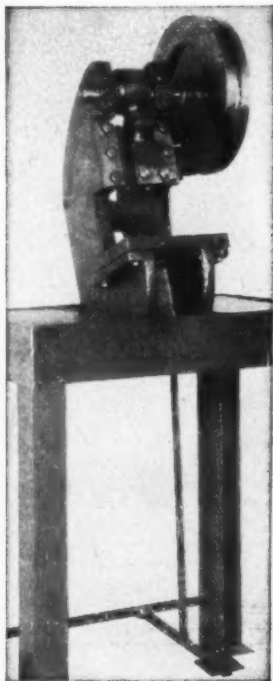
Dry, greaseless graphite is sucked from the large magazine in a thin film, providing constant lubrication for all moving parts. As shown above: A—Magazine for dry graphite; B—Ducts to bearings; C—Spindle bearings; D—Safety hood. Sturdily constructed, economical to operate. There's a plain type "Yellow Head" and full line of cutting heads.



CITY MACHINE COMPANY
Piqua, Ohio

PUNCH . . .

SMALL PARTS FASTER

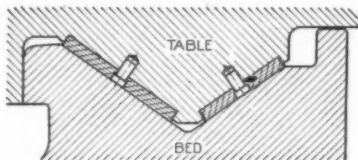


{ ALSO - 15 TON
AVAILABLE
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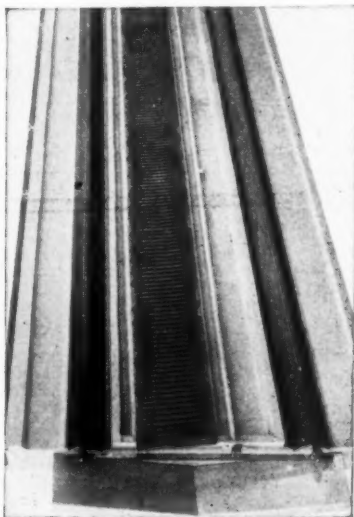
HUB POWER PRESS
W. F. BREWER MACHINE CO.
75 Laurel St., Hartford 6, Conn.

GRAY NON-METALLIC TABLE WAY

As the accuracy of a machine tool depends upon the accuracy of its guiding ways, the importance of maintaining the ways can hardly be over-emphasized. This point is stressed by the G. A. Gray Co., Cincinnati.



The Gray Non-Metallic Table Way consists of laminated plastic plates secured to the table by laminated plastic pins as shown on the sketch. The laminations of both the plates and the pins are at right angles to the bearing surface. Experience, as well as theoretical considerations, have shown that this is a matter of great importance. Laminated plastic bearings have been used for years by the Navy for stern bearings. They are used for roll neck bearings in steel mills where bear-



ing pressures of thousands of pounds per square inch are encountered. Also, millions of laminated plastic gears have been used as timing gears for automobiles, so that the non-scoring and wear-resistant qualities of laminated plastic are well and thoroughly established. The unretouched photo shows a planer table that has been in continuous service day and night for over two years. This planer is used for the heaviest work, and the normal return speed is 380' per minute. Note, that in spite of this excessive service, there is no evidence of any wear.

In addition to the non-scoring and wear resisting qualities so essential for all guiding surfaces, the laminated plastic has another advantage on high speed reciprocating members where the bearing surfaces may be subjected to heavy pressures, namely, its heat insulating quality. This is of particular value on planer tables, for without some form of heat insulation, even a slight temperature rise generated at the vee bearing surfaces is transmitted to the lower plate of the box section table, causing it to expand and curl up at the ends. This curling not only destroys the accuracy of the planer work, but also permits dirt to get under the table vees, and further increases the danger of cutting and scoring. As planer table speeds have very greatly increased

during the last few years, (many now running at 300' per minute) the danger of scoring and curling has greatly increased.

Due to the heat insulating qualities of the laminated plastic plates, practically no heat is transmitted to the metal table. In consequence, the makers assert it is possible to run the tables of Gray Planers with Non-Metallic Ways at any feasible speed without danger of the table curling up at the ends.

HARD-FACING ELECTRODES

One new and one improved shielded arc electrodes, each of the type designed for specific hard-facing applications, have been announced by The Lincoln Electric Co., Cleveland, Ohio.

"Abrasive AC", designated as a hard-facing shielded arc electrode, is designed for building up straight carbon steel, low alloy steel or high manganese steel with a self-hardening deposit to resist severe abrasion, battering and impact. Although specially designed for operation on a-c, it may be used for both the industrial type and small, mass-market type welding machines and d-c.

Properties of weld metal of this new electrode are of the self-hardening type

SPHERICAL, PLANE & COMPOUND TRIGONOMETRY

Made Easy
WITH
TRIG-EASY

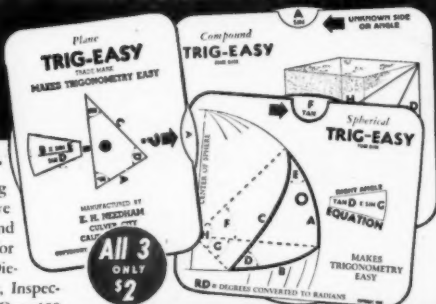
Without Knowing Higher Math.

NOW... with these amazing TRIG-EASY Charts you quickly solve problems in plane, compound and spherical Trigonometry. Get in line for a big-paying job in Tool and Die-Machine Shop, Sheet Metal, Layout, Inspection, Pattern Making, Die Bore, etc. Over 100 Trig problems at your fingertips. Used successfully by thousands. Three charts... including instruction book... all yours for only \$2.00. (Bills, check or money order only.) Don't delay! Send now for this short-cut to big pay and promotion. Money-back guarantee.

TRIG-EASY

SOLD BY EUGENE DIETZGEN STORES IN U. S. A.

E. H. NEEDHAM
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QUALIFY FOR BIG PAY!

E. H. NEEDHAM (Trig-Easy), Dept. 2-U Culver City, Calif.

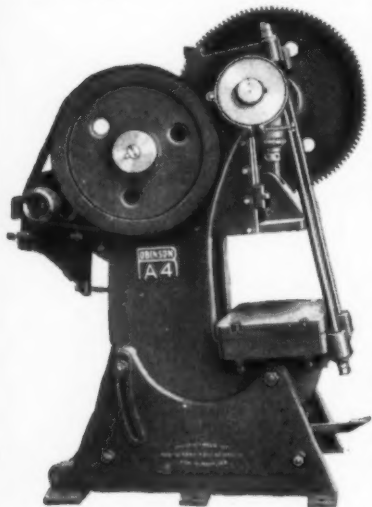
Dear Sir:
Enclosed find (\$) for TRIG-EASY sets or charts
as checked ☒ ☐

U. S. A. Negotiable Money Only.

NAME _____
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PLANE .50c each
SPHER. .50c each
COMPO. \$1.00 each
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Long Recognized for durability strength and service



● The new improved Series A Robinson Punch Presses retain all the sturdy characteristics of their predecessors with added safety, speed, strength and ease of operation and maintenance. Available in five sizes.

Send for descriptive Bulletin No. 7.

New Albany Machine Mfg. Co.
New Albany, Indiana, U.S.A.



alloy which is semi-austenitic and abrasion-resisting, and hardens very rapidly under conditions of impact and abrasion. Moderate peening will increase hardness as deposited from 20-40 Rockwell C to over 50 Rockwell C. The weld metal maintains its toughness and develops its maximum hardness only at the surface where it is cold worked. Thus at all times beneath the surface remains a cushion of softer metal which eliminates checking and flaking so common with abrasion-resisting metal produced by ordinary electrodes. The deposit is said to be more resistant to corrosion than high manganese steel.

The new electrodes are available in $\frac{1}{8}$ ", $\frac{5}{32}$ " and $\frac{3}{16}$ " sizes and is furnished in 14" lengths.

"Manganweld A", suspended for the duration, has been improved and is now manufactured specially for reclaiming worn austenitic manganese steel parts containing 11 to 14 percent manganese.

Generally recommended for flat work only, "Manganweld A" electrode produces a flat bead and melts uniformly with minimum spatter. Weld deposit is air-toughening, remaining in austenitic state and retaining carbides in solution even during air cooling. The deposited metal has a resistance to abrasion and impact that is equal to heat-treated cast manganese steel. Weld metal, as deposited, has a hardness 5 to 10 Rockwell C and cold worked, a hardness of 45 to 50 Rockwell C.

"Manganweld A" is recommended for all resurfacing and building up applications of high manganese steel and is sometimes applied only as top beads where an abrasion resisting surface is required.

The improved electrode is furnished in $\frac{5}{32}$ ", $\frac{3}{16}$ " and $\frac{1}{4}$ " sizes and 14" lengths.

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COOPER-BESSEMER TOOL HOLDER

A new line of drop-forged lathe turning and cut-off tool holders, embodying a patented feature for holding the cutting bit rigidly in place, is announced by The Cooper-Bessemer Corporation's Industrial Tool Division, Mount Vernon, Ohio.

The new turning tool holders, (Fig. 1 Top View), according to Frank Gardner, engineer in charge of this phase of Cooper-Bessemer sales, are forged from a special analysis steel known for its toughness, strength and maximum resistance to wear. The patented feature is a clamping pin which engages the bit for nearly its entire length. It contains two flush-type set screws which lock the tool bit into position with a vise-like grip, preventing any possible slippage.

A dowel holds the clamping pin in position for inserting cutting tool and prevents pin from falling out when bit is removed. (Fig. 2. Center) This dowel is easily removed to permit taking the clamping pin out when necessary.

According to Mr. Gardner, the exclusive design features of these turning tool holders offer these advantages:

1—The tool bit is held rigidly in both vertical and horizontal planes, which is essential for carbide-tipped bits and is desirable for all types of cutting bits.

2—The bit is gripped for nearly its entire length, preventing slippage and creating virtually a solid mass of bit and holder, to dissipate heat.

3—Bits cannot be mutilated by set-screw marks.

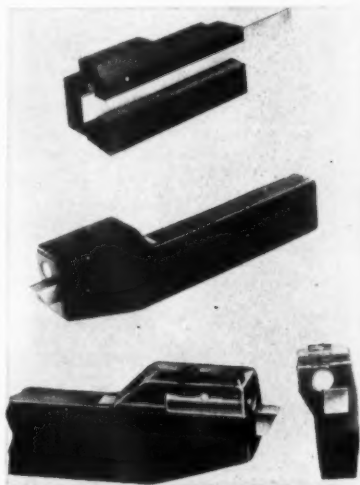
4—Bits as short as they can be ground may be used. They are held firmly in place and supported to the very nose of the holder. Oversize and under-size bits are held equally rigid.

5—Holder channel under bits cannot wear concave. Bits cannot break because of set-screw pressure.

6—Tool bits cannot chatter and they can take heavier cuts with higher speeds and feeds.

7—Roughing and reverse finishing cuts can be made without adjustment of the tool holder.

8—The tool bit can be removed for grinding or renewal and replaced in the holder at any desired position without disturbing adjustment of holder in tool post.



Advantages offered by the new cut-off tool holders (as shown in Fig. 3 Bottom view) are:

1—The cut-off blade is held securely vertical by a clamping pin at the top

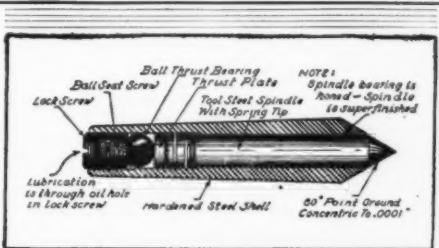
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which is accurately machined to a V-groove at the bottom. Blade is positioned horizontally and parallel to base of holder.

2—Clamping pin engages a considerable portion of the blade, holding it to a true cutting position regardless of side pressure imposed on blade.

3—Pressure is evenly distributed on blade without undue strain at any point.

4—The method of holding permits use of a shorter blade, making possible the use of a greater portion of original blade lengths. This prevents chatter or any undesirable movement of blade, making holder desirable for work requiring close precision.

5—The blade can be taken from the holder and replaced without changing adjustment in tool post.

6—It is being produced for both engine lathes and turret lathes.

These new tool holders augment the company's production of standard carbide-tipped single point tools and car-

bide-tipped face mills, shell end mills and side mills.

In developing its cutting tools, Cooper-Bessemer has had a distinct advantage in being able to use its own plant as a proving ground for nearly all phases of their use.

The demand for Cooper-Bessemer cutting tools has grown tremendously in recent years, Mr. Gardner said, and production which began as more or less of a sideline has now grown into an important phase of the company's production schedule. Main production, however, still centers around the design and manufacture of Diesel engines, gas engines and compressors for the heavy industries and in the marine, railroad and power-producing fields.

MEEHANITE BULLETIN

The Meehanite Metal Corporation Pershing Square Building, New Rochelle, N. Y., has prepared a four-page folder known as Form DM-145, describing typical application case histories including thread gages, upsetting dies and precision machinery. The folder also illustrates other special Meehanite industrial bulletins available. Copies will be sent upon request.

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For hand operated remote control of equipment located in out of the way places. For intermittent power transmission to $\frac{1}{4}$ H.P. Features heat-treated alloy steel gears and drop forged housings. Made in one size only suitable for $7/16''$, $\frac{1}{2}''$ and $9/16''$ O.D. shafts. Manufactured with the same precision and care which is characteristic of our ATLAS and VULCAN type Universal Joints.

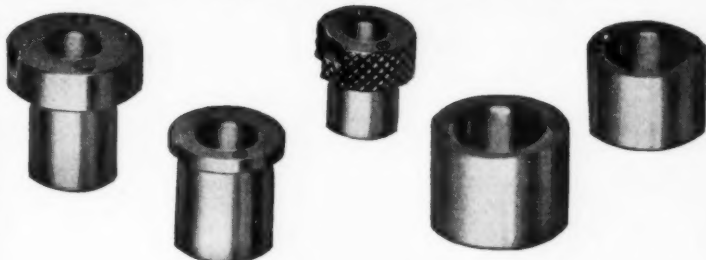
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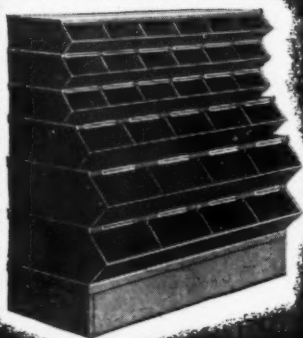
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SYSTEM

UNIVERSAL TOOL HOLDER

Designed to speed engine lathe production operations when a series of identical cuts are to be made, the Lane-Wells Type "L" Universal Toolholder consists of a body which fits into the lathe tool post in the conventional manner and detachable heads which hold standard high speed or carbide tipped tool bits.

These compact, sturdy attachments are made in four sizes to fit any engine lathe from 9" to 36" swing. Once the body is fastened in the tool post and the bits adjusted in the detachable heads, it requires

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less than three seconds to change from one tool to another. No machining is necessary to make the attachment fit a lathe and it can be moved from one lathe to another in the shop. Eleven different standard heads are available for boring, turning, facing, forming, drilling, reaming, tapping, etc. Special operation heads can be made from the standard blanks.

Full details are available from Lane-Wells Co., 5649 South Soto St., Los Angeles 11, Calif.

MOTRON SERVOMECHANISM

Servo Model 61-A developed by W. C. Robinette Co., 802 Fair Oaks Ave., South Pasadena, Cal., is a packaged continuous-balance control system of practically infinite sensitivity that can be applied to the automatic control or regulation of a

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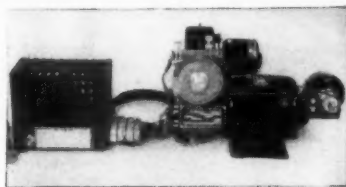
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large variety of practical problems to eliminate need of human supervision. Several miniature vacuum tubes directly control (without circuit-breaking contactors) the speed and direction of a standard 1/15 hp induction motor, according to the setting of the input-dial, which can be used to control other larger power sources.

The input-dial is mounted on selected precision instrument ball bearings and may be rotated by extremely small forces, such as electrical meter movements, pressure gages, flow gages, nylon or silk filaments, precision weighing balances, miniature motors and repeaters, synchronous electric clocks, wet paper fibres, air vanes, metal bellows and magnetic compass needles.



Input-dial controls either velocity or position of the motor to very accurate limits. Velocity in either direction may be limited from zero to maximum, independent of input-dial setting so that hunting instability can never occur. The motor may actuate any device or mechanism (with 30-75 in.-lb torque, 0-29 rpm) that controls the process, state, or condition measured on the input-dial, thus controlling and regulating the process. Alternately the motor may act as a torque amplifier or remote positioning agent. Since motor velocity (not torque) is controlled, load change or complete loss of load cannot cause instability.

The 61 A servo is designed for short time-constant systems and is usually capable of great sensitivity, 15/100 of one percent to 3/100 of one percent. Electronic components are in a replaceable plug-in can for instant servicing.

Suggested uses include:—Air velocity controller to within as close as 25 or 50 fpm or .01" of water; for separation of food products from chaff or sizing coal or other granular material; vehicle steering or cam following; tracer controlled mechanisms such as oxy-acetylene cutting or lathe duplicators; automatic weighing; antenna positioning; tensioning, guiding and winding paper, cloth, thread, wire, etc.

These efficient tool kits speed up your counterboring and spot-facing work, by putting a wide range of cutter and pilot combinations within easy reach. Seven sets from which to choose.

COUNTERBORE SETS

Write for Folder and Prices

THE GAIRING TOOL CO.

Roosevelt Park Box 478, Detroit 32, Mich.



This set includes: one type A-1 holder; nine cutters from $\frac{1}{4}$ " to $\frac{1}{2}$ "; eight pilots from $\frac{3}{8}$ " to $\frac{3}{4}$ "; two $\frac{1}{2}$ " countersinks, one 70° and one 82°, in hardwood box with hinged cover.

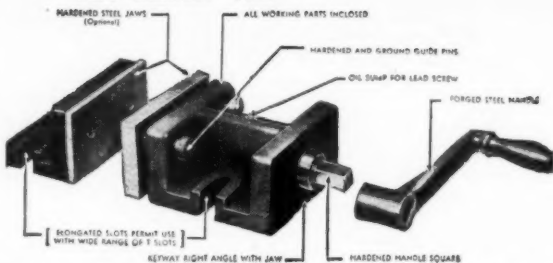
GAIRING
TOOLS

Utilizing 90 per cent of the longitudinal capacity of the flat table surface of any machine with "T" slots, the new Porterfield "Milpal" Machine Vise can be adjusted to hold work from zero to maximum capacity of the table.

The "Milpal" Vise does not incorporate the usual heavy vise base, but makes use of the flat table surface of the miller or other machine having a flat table with "T" slots, thus allowing the full vertical capacity for work from table surface to cutting tool, as well as the full length of flat table surface.

Construction of the Vise includes heavy semi-steel castings, heavy ribbing, steel jaws, heavy 1" 6-thread steel lead screw and bronze nut—both running in oil. True alignment is assured by key way in base of Vise riding in "T" slot of machine's flat table. Jaws are operated manually by screw adjustment.

THE "MILPAL" VISE



The Vises are manufactured by Porterfield Mfg. Co., 749 East 15th St., Los Angeles 21, Cal., in 5, 7 and 9" Jaw widths, the 5" size fitting "T" slots from 3 to 4 7/8" between centers and the 7" vise fitting "T" slots from 4 1/2 to 6 7/8" between centers while the 9" size fits "T" slots from 6 to 8 1/2" between centers.

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Threadwell Tap & Die Co., Greenfield, Mass., offers a complete line of High Speed Twist Drills matching in quality

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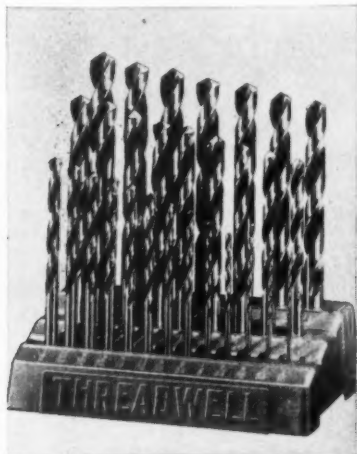
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Literature on Request

and accuracy Threadwell High Speed Taps and other precision tools.

Threadwell Drills include high speed taper shank drills in all standard sizes up to 1½" dia., and high speed straight shank drills in taper lengths, wire gauge sizes and jobbers lengths.



Sets of high speed straight shank drills are offered in sturdy and convenient metal stands, as illustrated, with each size of drill plainly marked on the stand, in jobbers lengths from 1/16 to ½" dia. by 64ths, and in wire gauge sizes from No. 1 to No. 60. Sets are also available in folding metal containers of cadmium plated steel which can be readily carried in tool boxes, etc. The drills are securely held in easy opening compartments on which drill sizes, tap sizes and decimal equivalents are clearly stamped.

Complete information is contained in Threadwell Bulletin No. 435, available on request.

SYNCHRONOUS MOTOR WELDER

By utilizing the inbuilt separate exciter of The Hobart Electric Drive Welder, The Hobart Brothers Co., Troy, Ohio, has produced a compact, high performing Synchronous Motor Welder. The unit is so proportioned that it can be started across the line and automatically synchronizes itself by the build-up of the separate exciter. The starting current on this unit is approximately the same as a



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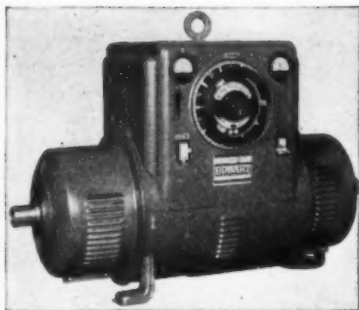
While the Milwaukee Die Filer is designed to aid the Skilled Toolmaker in his work . . . it encourages keen, accurate workmanship on the part of any operator. This is due to its simplicity of design and adjustment, its speed and convenience in setting up jobs.

Any mechanic of average skill can do precision filing, sawing and lapping on this reciprocal, bench type filing machine in the tool room, machine shop or trimming department.

The MILWAUKEE permits instant inspection of internal filing, sawing and lapping operations . . . quick change-over from one operation to another . . . cuts die-making costs.

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conventional induction motor of the same hp capacity.

It is recommended that the unit be operated to draw leading current at no load so as to compensate for other low power factor loads. Welding loads with their high hp demand and low duty cycle have long been a problem to Public Utility Companies. This unit with its unity or leading power factor characteristics makes it a power saving load, both

from the standpoint of the Public Utility and Customer.

Motor of this welder is of the Hobart Revolving Field Synchronous Type. It is furnished with heavy squirrel cage winding to make easy starting as a conventional induction motor. Once up to speed the exciter builds up and automatically applies correct excitation to motor fields.

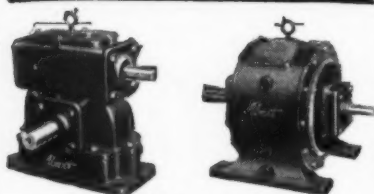
The machine can also be used as an a-c Generator for operation of small tools, lathes, grinders, etc. This is done by coupling shaft to a gasoline or electric motor and the synchronous motor then becomes an a-c Generator.

ALLOY STEEL ADVICE

T. W. Pennington, Vice President in charge of sales for the Jessop Steel Co., Washington, Pa., announces formation of a new Special Alloy Division to advise users of alloy steels in their reconversion programs.

The primary function of the Special Alloy Division will be to recommend and develop special alloy steels to fulfill requirements where ordinary steels will not give satisfactory performance. Staffed with specially trained field representatives, the new division will cooperate with the Jessop sales organization in solving problems of reconversion.

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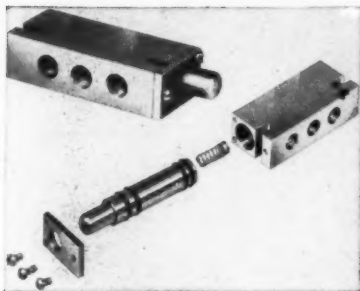
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THREE-WAY PILOT VALVE



A new Modernair 3-way pilot valve designed for use in the application of controlled air power to machine tool requirements has been announced by Modern Products, Ltd., 952 Grand Ave., Los Angeles 15, Cal.

Known as the CRV Pilot Valve, the unit is designed to be used as a 3-way valve, normally either open or closed, or as a 2-way valve, normally open or closed. The valve is compact, being 3 1/4" overall with the piston fully extended. CRV Valves

are operated, dependent upon the nature of the installation, by hand, foot treadle or cam.

The valves are used to operate air cylinders, air motors, air controls and single-acting cylinders such as those used on air vises, air chucks, etc. The valve may also be used in low-pressure hydraulic control and actuating systems.

The unit is fully balanced, operating freely under conditions of extreme pressure variation. The valve is normally supplied with 1/8" I. P. T. ports; however, other sized ports or threads may be furnished.

HOLLUP "SELECTRODE CHART"

A Selectrode Chart recently issued by the Hollup Corp., a division of the National Cylinder Gas Co., Chicago, guides electrode users in the choice of the correct electrodes for specific jobs.

It tells which electrodes to use, suggests applications, shows currents, positions, physical characteristics, etc.

Included are electrodes recommended for mild, low alloy and stainless steels, non-ferrous and cast iron, surfacing, as well as gas welding rods.

A copy may be had by addressing the Hollup Corp., 4700 W. 19th St., Chicago, Ill.



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"TOOL-FLEX" TOOL HOLDERS

A line of Tool-Flex Flexible Tool Holders is described in an attractive new four page bulletin issued by Burg Tool Mfg. Co., 6709 S. San Pedro St., Los Angeles 3, Cal. Available in 4 different types (models B, C, D, and E) the line provides a tool holder for every service regardless of the type shank or collet required.

These Neoprene mounted, positive drive flexible tool holders are designed to correct misalignment, cut set-up costs, reduce tool breakage, eliminate chatter and bell mouthing and reduce rejects. Intended for every type of second operation job these holders are especially adapted for the turrets of automatic or hand screw machines, engine lathes, tapping machines, radial drill presses, multi-matics, drill presses and portables.

These versatile tool holders are especially useful in tapping operations due to the flexibility and resilience of the Neoprene mountings. Tool-Flex is claimed to keep tap breakage at a minimum and taps are always centered. Wherever excessive wear is encountered on lead screws of tapping machines this can be relieved by the use of Tool-Flex Holders. Shocks are absorbed by the

Neoprene mounted adapter and taps adjust themselves to the lead screw travel.

The makers emphasize that in reaming operations it is important that reamers



be allowed to float, which is accomplished by the Neoprene mounting.

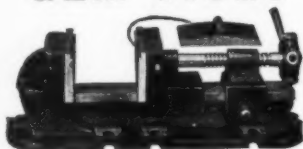
Tool-Flex Holders consist of but four parts. All metal parts are of alloy steel, heat treated and finished to close tolerances. The holders provide positive drive plus the flexibility of Neoprene and the Neoprene is oil resistant. The illustration shows the model B straight shank, straight collet holder.

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GEM VISES



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WELDED FABRICATION

A new engineering manual entitled, "Tailoring in Metal," is offered by the United Welding Co., Middletown, O. It discusses factors affecting the choice of

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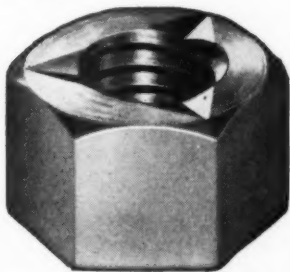
welded fabrication and techniques of welded design. Purpose of the manual is to help engineers and designers decide for themselves if fabrication by welding and the materials made available by this method are applicable to the problem. The factors involved in a decision are cost, weight, strength, appearance, stability, noise, quality and delivery.

Various types of welds are explained and how they affect static and fatigue load values. Of particular interest to the designer is specific information about devices that can be employed to reduce cost and improve construction. The text is profusely illustrated with drawings and photographs.

Altho written particularly for manufacturers of machinery and equipment, the manual is interesting to everyone involved in shop maintenance, because of the application of welding to such fabrications as gear blanks, pulleys, tanks, casings, housings, frames, breechings and stacks. Copies of the manual are available from United Welding.

GRIPCO LOCKNUT

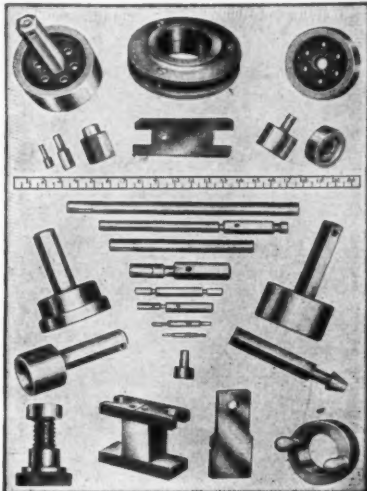
The Gripco Lock Nut is unique in design, in that it is a semi-finished, one-piece, self-locking nut of standard dimensions, not affected by oil, water or chemicals. It requires no lock washers or cotter pins, and a wrench is all that is needed to apply or remove it. The patented, simple, triangular deflections on top of nut provide a controlled friction lock. The nut is free-spinning until the bolt threads contact the deflected threads near top of nut.



It can be applied and reapplied many times without appreciable loss in its locking power.

Further details are available from Grip Nut Co., 310-Z South Michigan Ave, Chicago 4, Ill.

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Bulletins on any or all of these Products on request.



A. M. Sargent, newly elected President of the ASTE.



ASTE ELECTS NEW OFFICERS

A. M. Sargent, Pioneer Engineering Co., Detroit, was elected President of the American Society of Tool Engineers at the annual meeting of the Board of Directors, succeeding C. V. Briner of Pipe Machinery Co., Cleveland.



W. B. Peirce, First Vice President

Mr. Sargent is succeeded as First Vice-President by W. B. Peirce, Vice-President, Flannery Nut & Bolt Co., St. Louis, Mo., and formerly 2nd Vice-President.

Elected 2nd Vice-President was T. P.

Orchard, General Manager, American Tool Engineering Co., New York, N. Y.

Irwin F. Holland, General Superintendent, Small Tool and Gage Department, Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn., and formerly Chairman of the Society's Constitution



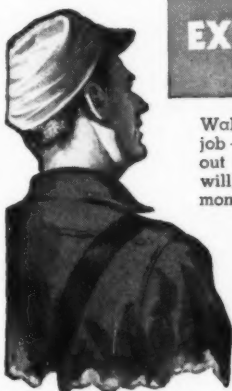
H. C. Conrad, Executive Secretary



R. B. Douglas, National Secretary

and By-Laws Committee was named third Vice-President.

R. B. Douglas, Works Manager, Propeller Division Canadian Car & Foundry Co., Ltd., Montreal, Quebec, and regional Director from Eastern Canada, was named National Secretary of the Society.



EXTRACTING BROKEN TAPS "MADE EASY"

Walton Tap Extractors are designed to do just one job — remove broken taps quickly, easily, and without damage to threads. No other device or method will do the job as well for a like cost in time and money.

Not only is the initial cost low, but the worth of salvaged parts and materials will pay for the extractors over and over again. Write today for Folder No. 12, and full details of our 30 DAY FREE TRIAL OFFER. Try them in your shop at our expense.

WALTON Tap Extractors

IMMEDIATE DELIVERY. List Prices of
Popular Sizes \$1.50 to \$2.20 each.

THE WALTON COMPANY

94 ALLYN STREET, HARTFORD, CONN.





V. H. Ericson, Treasurer

V. H. Ericson, Vice-President Johnson de Vou, Inc., Boston, Mass., was elected Treasurer, with W. Dawson, F. F. Barber Machinery Co., Ltd., re-elected as Assistant Secretary-Treasurer.

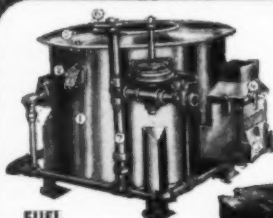
Harry E. Conrad was re-elected Executive Secretary.

In its first meeting under the Society's new constitution, the House of Delegates elected these Directors: — A. J. Denis, President, Murphy-Denis Corp., Los Angeles, Calif.; R. B. Douglas; Irwin F. Holland; Thomas P. Orchard; W. B. Peirce; A. M. Sargent; A. M. Schmit, General Manager, A. M. Schmit Co., Toledo, Ohio; Grant S. Wilcox, Jr., Assistant Master Mechanic, Plymouth Division Chrysler Corp., Detroit; C. B. Cole, Owner, Tool Equipment Sales Co., Chicago; and A. G. Collins, Chief Industrial Engineer, Hughes Tool Co., Houston, Tex.

Houston, Texas was selected as the site for the 1947 annual meeting of the Society.

GOTHARD INDICATOR LIGHTS

Catalog No. 46, issued by Gothard Mfg. Co., 2110 Clear Lake Ave., Springfield, Ill., lists and illustrates a large variety of Indicator Light Assemblies for panel board and instrument signaling. Specimens of assemblies built to order indicate another service field of the company. Several pages of text give scientific data on pilot lights, lens colors and polarized light.

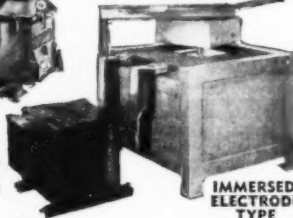


FUEL FIRED TYPE

Over 20 standard sizes or built to meet your needs. Note convenient lighting and observation port. Accessible clean-out. Ventilated stack connection . . . keeps useful heat inside furnace. Single valve operation.

IMPROVED SALT BATH FURNACES

Fuel Fired and Immersed Electrode Types



IMMERSED ELECTRODE TYPE

27 standard sizes

Temp. range from 400°-2400°

With or without conveyors for continuous Salt Bath Heat Treatment and Quench.

Write, wire or phone — there is a Dempsey representative near you.

FURNACES: Gas-Electric-Oil—"TAILORED" by DEMPSEY
Meet every Heat Treating Need

Write for Bulletin 3-7



DEMPSEY INDUSTRIAL FURNACE CORP.

Springfield 1, Mass.

WASHERS

on Tap
as You Need Them



**When You
Make Them
The HOVIS
Way**



Simply invest in HOVIS UNIVERSAL MASTER WASHER DIES. Then 5 small easily removable parts are all you need to change to make a new size washer.

Eliminate the cost of complete new dies. Make washers on short notice. Write for literature.

HOVIS SCREWLOCK COMPANY

8096 E. Nine-Mile Rd.

Van Dyke, Mich.

Suburb of Detroit

PEERLESS...

*Bench
Surfacer*
No. 601



Compact belt surfacer ideal for small work and for the tool room. A handy speed finisher. Furnished complete with motor and cord already to plug into your lighting circuit.

Complete unit mounted on cast iron base if desired.

**PRODUCTION
MACHINE COMPANY
GREENFIELD, MASS.**

THE DRILL WITH A HUNDRED AND ONE SPEEDS

All Speeds Instantly Available While Machine Is Running



SEND FOR CIRCULARS. TWO MODELS, M-125 $\frac{3}{8}$ CAP. M-96 $\frac{7}{8}$ CAP.
THE TAYLOR & FENN CO. — HARTFORD, CONN.

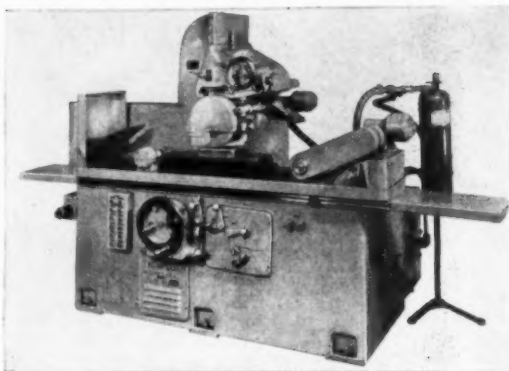
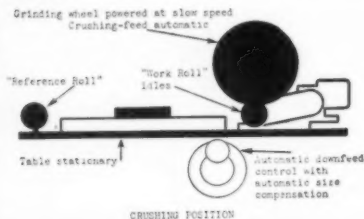
TRUFORMING IMPROVEMENT

Two master rolls are now provided on Thompson Truform Grinders which speed the production of precision flat form contours.

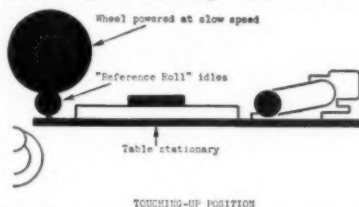
One roll, the "work roll", does the initial crushing and truing. A second roll, the "reference roll", spindle mounted on the opposite end of table, is used for touching up wheel and correcting form loss.

The grinding wheel, which has been touched up on the "reference roll", is run at grinding speed against the "work roll", thus re-processing it right on the machine without disturbing the set-up or removing anything.

By this means, the "work roll" can be re-ground whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out. Duplicate master rolls can be ground in the same manner before production is started.



For example:—on a modified buttress thread form which had an eight pitch form, a single master crushing roll provided only 125 dressings before the roll



had to be re-processed. Where two master rolls are used in the Truforming process, it was possible to obtain more than 15,000 dressings from the "work crushing roll" before it was worn out. . . . or an in-

PLEASE LET US HELP YOU IN TOOLING UP

WE DESIGN AND MAKE TOOLS, DIES, FIXTURES, SPECIAL MACHINERY
ESTIMATES SUBMITTED PROMPTLY FROM YOUR BLUE PRINTS

DELIVERY WHEN PROMISED { 50 TO 90 TON
CAPACITY OF
SMALL STAMPINGS

ALL NEW EQUIPMENT — 1000 HOURS PER WEEK . . .

YOUR VISITS ARE WELCOMED.

PH. JEFFERSON 1956

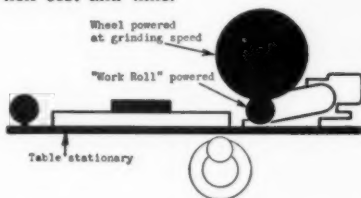
1686 E. HUDSON ST.

PHILP DIE TOOL AND MACHINE CO.

COLUMBUS 3, OHIO

crease of continuous production, without changing or disturbing the set-up, of 12,500 per cent.

On forms where the rolls provide fewer dressings, the ratio remains about the same, with similar economies in production cost and time.



REPROCESSING POSITION

Thus, on a simple flat form contour, working four pieces up and obtaining a production of 56 pieces between dressings, 250,000 pieces could be finished from a single "work roll" without disturbing the set-up.

The makers report that Thompson Turform Grinders speeded and improved the production of precision contours for the rotor blade root of roto-jet aircraft engines.

A new 8-page bulletin issued by the Thompson Grinder Co., Inc., Springfield, O., gives full information.

M-G-C PRODUCTS FOLDER

Motor Generator Corp., Troy, O., a division of the Hobart Bros. Co., has released a brochure covering a preview of the MGC products that are being offered for post-war sales. It includes new equipment developed during the war years 1941-45. Items illustrated are for application to high-voltage MG sets, battery charging, waste recovery, metal coloring and finishing, electroplating, materials handling and buffers and grinders.



For Machine and Tool Work & Quick Set-Ups

The only 3-way reading precision indicator. Accurate in either direction. Feeler mounted in centered cone bearings. .014 reading.

Price \$5.00 plus postage. Write for folder.

J. R. Reich Manufacturing Co.
45 E. Stroop Rd., Dayton 9, Ohio

3 NEW Featherweight KIPP AIR GRINDERS

MODEL JA

(Turbine Type Tool)—
Takes Wheels Up To
7/8", Speed 50000 RPM,
Collet 1/8", Weight 12 oz.
Overall Length 6 1/4"

\$29⁷⁵
IN U.S.A.



MODEL TT

(Turbine Type Tool)—
Takes Wheels Up To
1 1/4", Speed 30000 RPM,
Collet 15/64", Weight 2
lbs., Overall Length 9"

\$39⁷⁵
IN U.S.A.



MODEL PVT

(Vane Type Tool) — A
Power Tool For The
Heavier Jobs Taking
Wheels Up To 2 1/2",
Speed 10000 RPM, Collet
15/64", Weight 2 lbs. 4
oz., Overall Length 9"

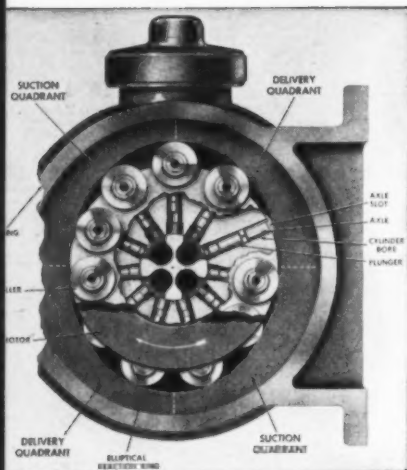
\$49⁷⁵
IN U.S.A.



Order Now!

You now have your choice of three Featherweight Kipp Air Grinders as illustrated above. All three are available for immediate delivery and priced extremely low. Madison-Kipp carries a full line of Kipp grinder wheels and accessories. Order today.

MADISON-KIPP CORPORATION
207 Waubesa St., Madison 4, Wis.



SUPERDRAULIC PUMPS

Superdrdraulic Pumps of simple, compact design, in models light enough for a man to handle, with a continuous duty development of 5,000 psi and 40 hp, delivers 0 to 17 gpm at 1200 rpm. According to the makers, specifically and in detail the Superdrdraulic Pump:

1—Generates the desired tonnage for hydraulic presses and cylinder actuated machinery without aid of prohibitively large and expensive cylinder assemblies.

2—Provides a single source of high pressure and high volume which in many circuits eliminates cost and complication of a double pump arrangement.

3—Provides a long needed instrument for the field of hydraulic production test equipment, also for experimental test equipment field.

4—Eliminates necessity of employing costly and cumbersome intensifiers and accumulators (with all of their attendant disadvantages) in hydraulic circuits up to 5,000 psi.

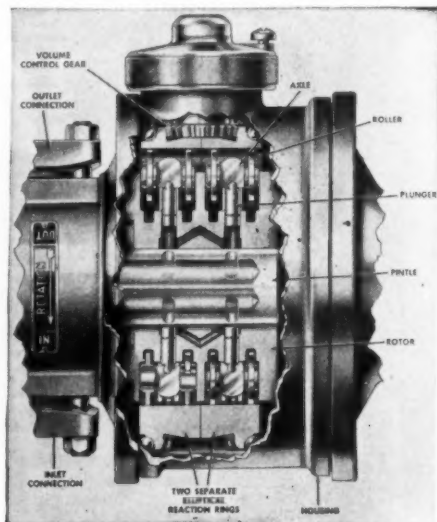
5—Will give birth to new hydraulic products dependent upon compact hydraulic generators of extreme pressure and high volume such as fully hydraulic drives for the Automotive, Railroad and Marine fields. . . and these high pressures are particularly significant to the Petroleum, Diesel and Plastics industries too.

6—Supplied in two models—Constant or Variable delivery types—completely adaptable.

The Pump is a radial type plunger pump arranged so that centrifugal force maintains plunger rollers in contact with an elliptical reaction ring. Plungers are fitted to cylinders in a rotor in one or more banks of 11 plungers per bank. The rotor turns on a fixed pintle which has suitable ducts and ports for directing the oil inlet into those cylinders passing thru two opposite quadrants and also for directing oil delivery out of those cylinders passing thru the other two opposite quadrants.

Each plunger makes two inlet and two delivery strokes per revolution. A sturdy equalizing axle, journaling a roller at each end, is universally attached to outer end of each plunger. This construction provides ample bearing areas for plunger load components exerted radially and rotatively on axle bearing surfaces and insures zero side loading of plunger.

In variable delivery pumps, two banks of 11 plungers each are arranged in a single rotor. Plungers in the two banks are arranged in parallel relation. Each pair of parallel cylinders is in open communication by means of a drilled passage in rotor. Plunger rollers, of each bank, roll against a separate elliptical reaction ring. These reaction rings are rotatably mounted in pump housing and are geared together so they rotate in op-



posite directions in response to rotation of the volume control gear.

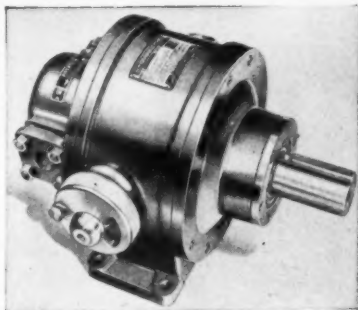
At full delivery, major axes of the elliptical reaction rings are parallel and at zero delivery, major axes are 90° apart. Under the latter condition, the net delivery stroke is zero, since displacement, of the plungers moving radially outwardly, exactly equals the displacement, of plungers moving radially inwardly, in both delivery quadrants and both suction quadrants.

As the angle between the major axes is reduced from 90°, the net plunger displacement increases. When this angle becomes 0°, the major axes are parallel and both plungers of a pair of parallel plungers reciprocate in phase thru full delivery and suction strokes.

Provision is made for a simple spring type plunger return. This is to insure plungers return when pumps are operated below the speed at which centrifugal force is adequate (approx. 100 rpm). Variable delivery pumps are equipped with any one of a number of different type volume controls which are interchangeably mounted on pump. The sensitive manual dial type control may be mounted on either side of pump. The surge-proof balance pressure compensator is constructed to mount on either side of pump with a volume dial indicator mounted on side opposite pressure compensator.

Plunger reaction loads exerted on the elliptical reaction rings are balanced thru the volume control gear, the torque of one reaction ring balancing that of the other. Thus light and sensitive manual or automatic pressure and volume controls can be interchangeably employed.

A small oil circulating pump is incorporated for the purpose of circulating oil under near zero pressure direct from the oil tank thru the pump housing and back to the tank. This insures sufficiently low pump housing temperatures of the variable delivery pump under the con-



dition of extreme pressure operation at zero or near zero delivery.

CARBOLOY MASONRY TOOLS

A line of Carboloy cemented carbide tipped and faced masonry tools recently introduced by a Detroit organization is reported to be giving excellent results. The development had its inception when Ralph Gwinn, a brick mason asked his son Myron, who worked at Carboloy Co., Inc., to consult the company regarding the troubles he had with his regular tools—involving frequent sharpenings, etc.

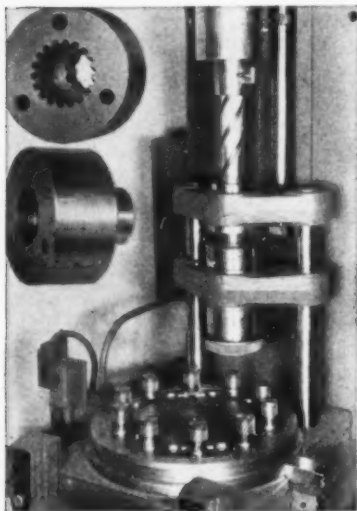
A set of masonry tools, comprising a scutch to trim bricks, a brick hammer, with Carboloy metal on both hammer head and cutting edge, a tile setter hammer, and a 3" brick set used to cut glazed brick were tipped with Carboloy, and ground to shape.

The results, according to Gwinn were so surprising that—after a month with not a tool requiring sharpening—the Gwinns decided to go into the manufacture of Carboloy tools for the masonry trade. The business is reported to be flourishing.

CHARLES K. DAVIES & SON **PATENTS — TRADEMARKS**

7240 WISCONSIN AVENUE
WASHINGTON 14, D. C.

BROACHING BLIND HOLES



An ingenious and effective use of broaching where at first glance its applicability seems out of the question is illustrated in an installation recently completed by Colonial Broach Co., Detroit. The job involves production of helical splines in a blind hole in a transmission part, the design being such that the tool cannot pass thru the work. (The parts are shown in the inserts in upper left.) Theoretically, therefore, broaching could not be used. However, the use of broaching with its advantages of combined precision and high output, was made possible by simply undercutting a

recess beyond the section of the part to be splined (for broach clearance at end of the cut). Ten short broaches—each with five sets of cutting teeth—are used in place of a single long broach. Further, instead of actuating the broaches, the part is held in the moving ram head, the latter being equipped with a master lead bar actuated by movement of the ram. The broaches are mounted on an indexing table (hydraulically actuated).

Machine cycle is completely automatic. The operator merely loads the part and pushes a button. The ram moves down pushing the part over the first broach. The ram returns and stops. The table automatically indexes to the next station. The cycle then repeats automatically until the part is finished at which time the machine stops for reloading.

The part, of course, is stripped off the broach on each return stroke. Obviously, also, broaches must be exactly spaced and located so that the teeth of the different broaches will track each other as they progressively cut the spline to finished size and shape. With this arrangement the cutting effect of the 10 short broaches is the same as if a single long broach were used.

DoALL GAGE BLOCKS

A new and different gage block has been introduced by the DoALL Co., Minneapolis, Minn. which is said to extend use and application of gage blocks; increase wearing qualities and permit the average person to use the gage blocks without difficulty.

These advantages are made possible by the use of DoALLOY, a wear-resistant alloy having expansion characteristics similar to steel. Life of this new block is said to be 60 times that of steel blocks and 20 times the life of chrome-plated blocks.



Plain Type

CLOSED

TRADE



CLOSED

MARK



Offset Type

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

**AUTO MOULDING
& MFG. CO.**

**2326 S. CANAL ST
CHICAGO**

SPECIFICATIONS:
Open Width $\frac{1}{8}$ " to 6"
Gage Material .040 to .125
Pin Diameter .101 to $\frac{1}{8}$ "
Lengths to 120"

SEMI-OFFSET

Heretofore, it has been impractical to use wear-resistant materials for gage blocks, for they were only accurate at 68° and therefore could not be used except in a temperature-controlled room. These high abrasive-resistant gage blocks can be used under any temperature conditions, in the shop, tool room or inspection department.

The blocks are accurate for dimension, flatness and parallelism and are said to be more accurate than the standards set up by the National Bureau of Standards. The surface finish averages .5 rms and has a bright silvery appearance.

They will remain flat under severe temperature changes, it is claimed, and will retain their accuracies even tho subjected to temperatures of 120° below zero to 500° above zero. In addition to the improved heat treatments thru which these blocks are carried, they are also subjected to a DoALL stability treatment, being frozen to subzero temperatures and then heated thru a series of cycles.

All blocks whose dimensions are .250" or smaller are of solid DoALLoy. Blocks from .300" and larger are faced with DoALLoy on their wear surfaces. This



face is fused to the steel core in such a manner that it is impossible to separate them.

The blocks are said to be extremely acid-resistant and will not discolor when subjected to many of the acids ordinarily encountered in production. Steel cores of the faced blocks are chemically treated, leaving a jet black finish, which penetrates the surface. This surface is extremely hard and will stand an unusual amount of wear, and will not rust.

Cincinnati's
LARGEST

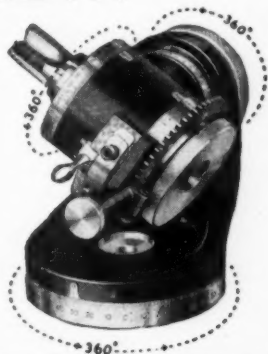
**HOTEL
GIBSON**



**Famous for
Friendliness**

Randall Davis, General Manager

CLEVELAND INDEXING HEAD . . .



Holds all Straight or Taper Shank Tools from 1/16" to and including 1 1/2" diam.

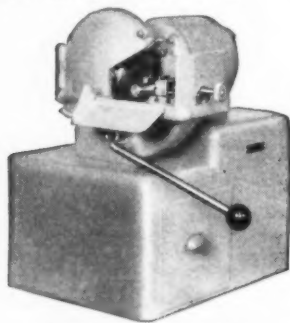
Write for Catalog

GRINDERS & FIXTURES, Inc.
1249 W. 4th St. Cleveland 13, Ohio

BUEHLER CUT-OFF MACHINE

A new one hp abrasive cut-off machine is announced by Buehler Ltd., makers of metallurgical laboratory equipment. This cutter, No. 1015, is designed to fill the need for a high grade cut-off machine at a moderate price. It is a table mounted model, occupies small space, yet is capable of cutting metal samples up to 1" stock. Coolant is supplied by a recirculating tank No. 1016, placed on the floor with hose connections to cutter.

While designed primarily for the metallurgical laboratory, this cutter is also adaptable to general industrial use where precision and accuracy are required in abrasive cutting. The manufacturer, Buehler, Ltd., is located at 165 West Wacker Drive, Chicago 1, Ill.



REDMER 3½" CHUCK

Redmer Air Devices Corp., 608 W. Washington Blvd., Chicago 6, Ill., announces a new model to be known as the No. 4. It will have a collet capacity of 3½" and will use a special type 3½" master collet. Various size pads can be had to reduce the hole diameter to the desired size.

High Speed Cutting Tools

- Special high speed circular, dovetail, flat form and special tool bits.
- Design and manufacture of small machines, jigs, gages, dies and experimental parts calling for greatest accuracy.
- Regrinding and salvaging high speed flat form, special bits and small flat broaches.

WRITE FOR QUOTES

Representative Wanted

Lincoln Park Manufacturing Co.

3302 Dix Road

Lincoln Park, Mich.

The No. 4 chuck now allows work up to 3½" to be held to the desired depth, as the parts can drop thru the entire depth of the chuck. This is a decided advantage over the previous method whereby depth was limited to depth of the step of the collet.

The same principle is used as in other models, in that collet remains stationary; the opening and closing being controlled by the sleeve. By this method, depth of the work can be controlled even though there are variations in diameter of the work to be held as there is no up or down movement of collet.

COLES LIVE CENTERS

Old-fashioned dead centers work hard under modern carbide cutting speeds. Since these higher speeds are a "must" in production schedules, the answer is live centers.

To meet this situation, Coles Live Centers are offered by The Raymond Corp., 412-A Republic Bldg., Cleveland 15, Ohio. They point out that in practically all types of machining between centers, the greatest load exerted is thrust load, which ranges up to approximately 800 pounds. This pressure multiplies sometimes two or three times as the stock is cut from the bar and the heat generated causes the stock to lengthen axially. Dead centers and even some types of live centers fail under these conditions. It is claimed that the Coles Model 100 Heavy Duty Live Center will more than withstand such pressures.

A full length rotating center point is provided to minimize chatter and sway at point of contact. This rotating center extends deep into the shank of the housing, thus allowing more material to absorb chatter and using the farthest possible bearing point to eliminate side sway.

The alloy steel rotating center point is hardened to 62-65 Rockwell for greater wear resistance. Every live center is guaranteed to have true concentricity within .0002".

These Centers are provided with a matched set of Duplex ball bearings in the heads. The bearings take the full radial load with minimum friction and wear. Since these double row bearings are assembled in a tandem position, the maximum thrust and radial capacity are obtained.

A thrust compensator is provided which allows rotating point to move backwards when the thrust pounds multiply and danger of overloading becomes a factor.

Deep in the shank is the bearing that stops side sway in the point. This is a stationary Oilite bearing with excellent wearing qualities. Permanent dust and oil seals keep foreign matter out and lubricant in. No need to oil since Coles Live Centers are lubricated for life.

Shanks are ground to standard sizes plus or minus .0005" tolerance giving absolute bearing surface for the entire length of the shanks. They are hardened to 55-60 Rockwell, eliminating the chance of scars which cause misalignment. A bulletin gives full details.

OVERLOAD AND JAMMING RELAYS

To provide almost instantaneous magnetic overload protection on general purpose and mill motor applications, and to prevent damage to hoist, windlass and capstan equipment when the load or cable jams on marine control, a new type AYJ relay for d-c operation is announced.

The single-break normally closed main contacts and the double-break auxiliary contacts are suitable for carrying 5 amperes continuously and for interrupting a d-c inductive coil load of 150-volt-amperes maximum. Type AYJ relays are operated by a series or copper strap wound type of coil. Coils and coil studs are available for currents ranging from approximately 75 to 625 amperes. The coils and auxiliary contact parts are insulated from the relay frames for 600 volts.

Of sturdy unit construction with a knife-edge bearing between the armature and the frame, the relays are completely assembled and tested at factory before shipment. Ground armature and frame surfaces are plated with hard chromium for protection against corrosion and wear.

Further information is available from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

WOOD PATTERNS METAL	
WOOD	Any type models, dies, jigs, forms and fixtures.
METAL	All facilities for making metal patterns, match plates and templates.
FINEST WORKMANSHIP	
Competitive Prices	Fast Service
Send prints for quotes Representative Wanted	
DAVIS PATTERN & MFG. CO.	
16903 Livernois	Detroit 21, Mich.

**MORE POWER
GREATER RIGIDITY
INCREASED CAPACITY**

in the New Model M-30

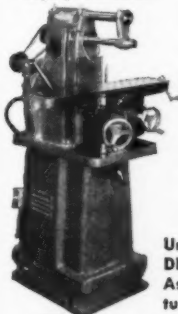
Diamond Miller

Quick Specifications!

Table Size	Long. Travel	Trans. Travel	Vert. Travel
7" x 30"	18"	6"	10"

FEATURES YOU'LL LIKE:

- Increased table area with 18" travel accommodates bigger jobs.
- Widely-spaced, hand-scraped dovetails and increased dimensions throughout provide exceptional rigidity.
- 1½ horsepower to spindle supplies power for heaviest cuts in all metals without chattering or stalling.
- Built-in gusher pump coolant system.
- Automatic table feed or rack and pinion table feed for high production.

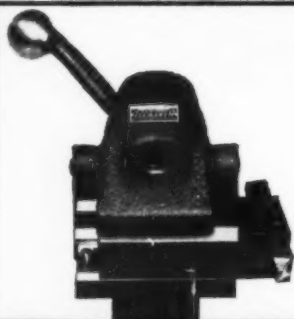


Fully enclosed variable speed drive permits selection of any spindle speed from 75 to 1,200 r.p.m. Spindle noses are hardened and ground with #9 B & S Taper, mounted in free-rolling Timken Taper Roller Bearings, adjustable for takeup.

Undoubtedly, the finest DIAMOND mill yet built! Ask today for free literature and quotations!

Diamond
MACHINE TOOL CO.
Dept. B, 3429 E. Olympic Blvd.,
Los Angeles 23, Calif.





PRODUCTION SPEED with TOOLROOM PRECISION from YOUR ENGINE LATHE

*With the Lightning-change,
Positive-repeating*

BAKEWELL TOOLHOLDER

Mount tools for all operations in Bakewell Toolbars—as many operations as you wish on one set-up. Single positive action locking lever assures quick change and positive repeating. Ample rigidity on heaviest cuts. Adjustable stop in toolbars permits use of master stop on many production jobs.

Manufactured in three sizes for engine lathes from 9" to 36" swing. Shipped complete with riser plates, Allen wrench and toolbars as ordered.

WRITE TODAY for further details and name of your nearest Bakewell representative.

BAKEWELL PRODUCTS

Dept. T. M. T. 2427 E. 14th St.,
Los Angeles 21, Calif.

P&W EXTERNAL COMPARATOR

Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., announces the Model CE-699 Electrolimit External Comparator for checking Balls. This Comparator is equipped with a Special Gaging Spindle, Anvil and Backstop, adapting it especially for the inspection of Balls.

The Gaging Spindle and Anvil are identical pieces having a T-C Gaging Tip with .020" radius. The Backstop is a T-C Vee located in the Anvil Fixture with provision for both vertical and horizontal adjustment.

The indicating meter can be graduated in "tenths", "half-tenths" or "hundredths", to meet any inspection requirement.



WET BELT MACHINING FILM

A new film on the Wet Belt Machining Method of surfacing, grinding and stock removal is now available to engineers, design and production executives, planning and methods engineers, tool room and die room foremen and all other interested members of the metal industry. The film is sent free upon request for private or group showing.

The film is a 16 mm sound, black and white visual presentation entitled, "A Machine of the Age". It can be projected from any standard 16 mm machine running time, 11 minutes.

It traces development and perfection of the Wet Belt Machining Method from its earliest Dry Belt forerunners to its ac-

ceptance as a machine tool used on production orders running into hundreds of thousand pieces as well as its application on single piece operations in tool and die rooms, repair and maintenance and other departments. Case histories of savings and increased production resulting from this method are presented.

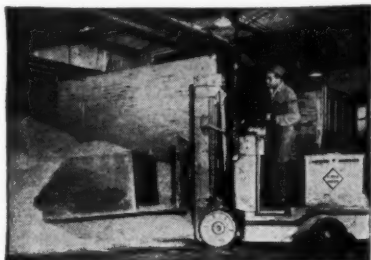
The film shows how surfacing, grinding and stock removal operations are performed. It is complete with technical information on amount of stock removable, kind of finish attainable and tolerances held on such various materials as: ferrous and non-ferrous metals, glass, plastics, wood and ceramics.

This visual presentation shows:—removing risers, flashings and parting lines from cast materials; surfacing large, flat areas to close tolerance; chamfering, edging, squaring, rounding and cutting radii on single piece operations. The Automatic Feed Table, supplying mechanical pressure for hand pressure and with which .0005" tolerance is attainable, is visually presented.

The film is obtained at no cost except return postage, from the Porter-Cable Machine Co., 300-2 Exchange St., Syracuse, 8 N. Y.

METALS SCOOP FOR FORK TRUCK

In handling large quantities of metal borings and turnings for shipment to smelters a motor car company uses a scoop of novel design. This enables it to transport metal from storage bins to road truck or to freight car by means of an Elwell-Parker power truck equipped with a swivel-mounted fork.



The scoop is made of steel plates welded together, in a box-like structure open at

BOW MICROMETERS

INTERCHANGEABLE MANDREL TYPE

COMPLETE SETS WITH MANDRELS AND STANDARDS IN CASES

When equipped with a set of 6 mandrels each Tubular Micrometer is in reality Six-Micrometers-in-One because each mandrel in the set of six is precision-fitted to the Micrometer with which it is furnished and is instantly accurate and ready for operation upon insertion in micrometer frame.



Will Not Rust or Tarnish:

Being made of special steel which is triple plated with copper, nickel and chromium making them rust resistant.

Cat. No.	Size	Per Set
M-04.....	0 to 4 inch.....	\$25.50
M-06.....	2 to 6 inch.....	33.50
M-09.....	6 to 9 inch.....	39.50
M-1.....	6 to 12 inch.....	64.50

Cat. No.	Size	Per Set
M-2.....	12 to 18 inch.....	\$79.50
M-3.....	18 to 24 inch.....	99.50

(Also available in sets up to 96 inches)
Complete catalog on request.

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128 LAFAYETTE ST.

NEW YORK 13, N. Y.

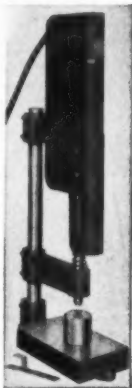
top and front end. Two separate sleeves to receive the fork's tines are welded to the bottom plate, inside the scoop. A portion of each sleeve extends thru an aperture cut in the rear plate. This causes the scoop to be set well out in front of the truck, one advantage being to protect the truck's rubber tires.

In operation the tines are inserted in the sleeves and the truck pushes the scoop into a pile of loose metal. The course of the scoop is forward, and also upward due to the tilting mechanism on the forward part of the truck. The load is carried in an elevated position, to clear obstruction, with the scoop at an angle of 45° from horizontal in order to hold the maximum amount of material. It may be elevated if necessary to the full height of the fork's lift, 117 inches. The scoop is emptied by being turned over by means of the rotating device on the truck, actuated by the truck's battery power. Upper front edges of the scoop are cut away at an angle to facilitate its penetration into the metal.

MEAD IMPACT HAMMER

Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill., announces a new air power unit, known as the Impact Air

Hammer. This small machine, weighing only 27 lbs., is capable of performing a wide variety of operations, which heretofore have required larger and more expensive machines.



One of the outstanding applications is multiple piercing operations on large



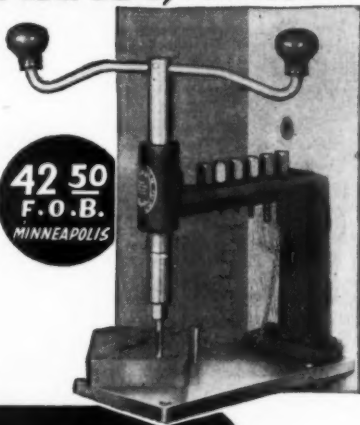
TAP BREAKAGE *Reduced*

**Square, Straight
Boring in
Half the Time**

The Dahlstrom Tap Guide practically eliminates tap breakage and saves wasted hours getting broken taps out of expensive dies. It does the job in a jiffy with work always straight and true. Just fasten it to a post or bench, slip a Tap Adaptor into the spindle, and even an inexperienced operator can handle it. Equipped with 7 Adaptors, ranging from 8-32 to 1/2". Taps not furnished. Ask your mill supply house, or \$42.50 F.O.B. Minneapolis.

Literature on request.

Dahlstrom Manufacturing Co.
416 South Sixth Street, Minneapolis 15, Minn.



Dahlstrom TAP GUIDE

metal sheets—either before or after forming. The extremely narrow over-all width of the machine permits punching holes as close together as $1\frac{3}{4}$ " on centers.

There is no specific limit to the size of the sheet or number of holes that can be pierced in one operation. A suitable table can be made with a heavy steel plate, 1" to $1\frac{1}{2}$ " in thickness, provided with rows of tapped holes by which the units can be dogged or bolted down in any desired location. Tables up to 8 x 40 feet can be made. If desired, such tables can be provided with "gates" at one end, so the punches mounted at that end can be swung out to permit insertion and removal of work. Thus, all four sides of a sheet can be pierced at one time, assuring accuracy and reducing handling time. Where smaller work is to be pierced, several groups of Impact Hammers may be mounted on the one large table, each group being independently controlled by its operator. Thus each operation may follow its own cycle, and need not wait for the slowest of the group, as sometimes happens when press-brakes are used.

Set-ups are quick and easy, due to the light weight of the units. Very little storage space is required in the tool crib; Impact Hammers can be kept on a shelf like a row of books.

For punching operations, it is normally used in conjunction with standard punching units, such as Wales-Strippits. The machine can be operated in any position, which makes it adaptable to piercing large sheet metal items after forming. The capacity on 100 psi is $\frac{3}{8}$ " hole in .065" cold rolled steel. The ram delivers a blow equivalent to approximately 4000 lbs pressure. With suitable attachments, the Impact Hammer is also efficient for up-setting rivets, blanking out soft materials with knife dies, light coining and forging operations, stamping letters and numbers on plastics and other synthetic compositions, brass, bronze, aluminum and steel.

MAGNETIC CHUCK FACTS

A new 18-page brochure describes in detail the complete line of Hermeti-Coil Electro-Magnetic Chucks manufactured by the Hanchett Mfg. Co., Big Rapids, Mich.

Just off the press, this bulletin carries latest information on the application of magnetic chucking to a wide range of work, under all conditions. Several pages are devoted to illustrations of actual set-ups to aid the production men in visualizing this method of work-holding as applied to their own machining problems. It is one of the most comprehensive cat-

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To insure maximum economy and performance in Carboloy Diamond Impregnated Wheel Dressers, there's layer after layer of diamond-studded "skin"—the stones in each ready to go to work as exposed.

The best obtainable in industrial diamonds, each stone is bonded in a special Carboloy matrix that prevents accidental diamond loss—provides FULL utility to the last diamond particle.

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CARBOLOY COMPANY, INC.

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DETROIT 32, MICH.

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alogs available on the subject of magnetic chucks.

The entire center section consists of cutaway photos and step-by-step discussion of the construction of these waterproof, shockproof magnetic chucks. Special attention is given to the new laminated top plate chuck which increases usable work-holding surface by 22%.

LIVE CENTERS

A new four page catalog completely describing "Engineered" Live Centers, has been released by Sturdimatic Tool Co., 5220 Third Ave., Detroit 2, Mich.

It gives specifications and prices of the Standards which are made with Morse taper and also includes three types of Specials. More than 40 other Specials are illustrated in this literature which were "Engineered" for some specific purpose metal working operation. Characteristic of the design of all Sturdimatic Live Centers is a low overhang and a slight cushioning action. . . . that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. . . . Large thrust bearing takes all thrust load, large radial bearing takes only radial load.

SIEWEK MIDGET JIG

A new, midget-type spring jig is now offered by the Siewek Tool Division of Domestic Industries, Inc., 231 So. La Salle St., Chicago, Ill. It was developed to fill a long felt need for a small, lightweight jig for handling many small items including radio parts, electrical devices and a large variety of other small parts.

Designated in the Siewek line as "No. 1500", this new small jig weighs only 6½ pounds. Like other Siewek Midget-type Jigs, it is built to precision standards—highly accurate for fine work. A powerful, positive locking action has been designed to avoid release under chatter.

Other features include absence of back lash and provision for right and left hand operation. Spring tension is quickly adjusted by lock nuts at the head of the posts. This jig locks securely when the handle is down. Quick release is provided for. Plenty of room is allowed for chip clearance.

Interchangeable top plates save time on re-tooling operations. Siewek Midget-type Jigs are quickly adaptable to a variety of work by re-drilling a new top plate and fitting new adapters. In effect, this provides a new jig at a fraction of the cost of a complete unit.

STANLEY 214 UNISHEAR

Light in weight, easy to operate, Stanley No. 214 portable electric shear cuts 14 gauge hot rolled steel and other sheet materials in proportion. It was first introduced for use in aircraft production, but also proved its usefulness in many manufacturing plants and metalworking shops where sheet steel, aluminum and galvanized iron are fabricated.



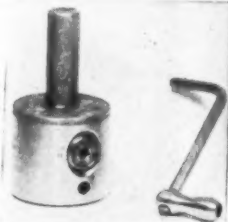
No. 214 Unishear has a simple, improved blade motion that "Feeds in" the work so that little effort is required by the operator to cut straight lines, curves, angles and notches accurately and with-

ATTENTION TOOLMAKERS

BORING CHUCK . . .

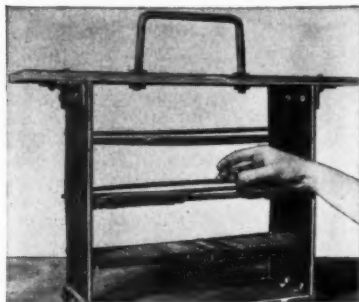
$\frac{3}{8}$ " ADJUSTABLE IN THOUSANDTHS
. . . $\frac{3}{8}$ " TOOL DIAMETER

SMITH BORING CHUCK CO.
12 CRESTWOOD DRIVE MANCHESTER, CONN.



out distortion of material. Blades can be removed easily for re-sharpening and replaced quickly. Duplex handle permits operator to grip at position most convenient for his or her use. Minimum number of moving parts. Slide operated switch is conveniently located in handle. Full ball and roller bearing construction Alloy steel yoke. Universal type motor operates on either a-c or d-c. Available for 115, 220, 230 or 250 volts. Further details from Stanley Electric Tools, Division of The Stanley Works, New Britain, Conn.

MICARTA DIPPING RACK—When an acid cleaning bath is used for small parts such as the punchings shown, the dipping rack is subject to constant repair and replacement due to corrosion. At the East Pittsburgh Works of Westinghouse, a Micarta rack has outlasted the heavy brass rack it replaced several times; its inherent lightness also makes it easier to handle. Altho brass rods and bolts tie together this model. Hipernik will be used in the future because of its higher corrosion resistance.



THERMOCOUPLE DATA BOOK

Directed to purchasing agents, chief electricians and metallurgists is a new 16-page catalog describing a complete line of industrial thermocouples, their parts and accessories and providing engineering data for their use with all standard pyrometers. New improvements claimed for the Richards products exclusively include seamless drawn nickel-chromium protecting tubes, enclosed terminal heads which permit quick inspection and a connector which saves time in assembly and a UT fitting which permits a broken porcelain tube to be readily replaced at the furnace without tools or cementing. Items are illustrated and priced.

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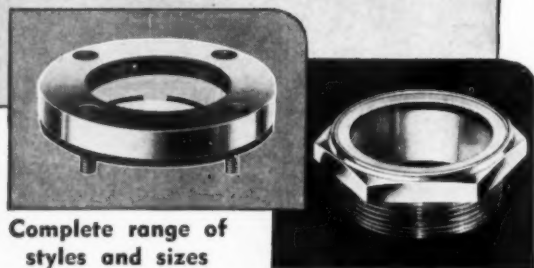
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HOLE CUTTERS

Methods of making uniform holes of fairly large diameter, in relatively thin metal, are always of interest, especially since the need for making such holes occurs with increasing frequency as the years pass.

It is often the case that a hole of small diameter must be drilled first on the center where the full-sized hole will be located, in order that the hole saw, or similar tool being used, may be supported by a center pilot.

However, there are many other instances in which small drills are incorporated directly into the hole saws or

other cutters, the arrangement being such that drills extend beyond the hole cutters proper. Thus, the drills enter the material to a considerable depth before the hole cutters engage, supporting them properly, and doing the complete job in one operation.

One popular hole saw is provided with a center drill having a very sizable shank. To this shank is attached a cup-type member, by means of set-screws. This cup-type member holds a piece of saw steel in cylindrical form.

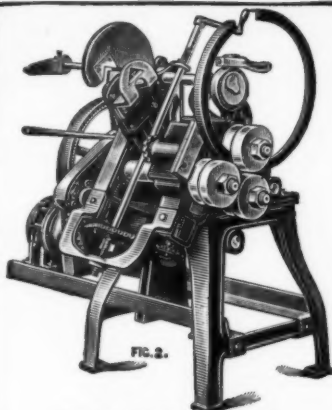
The lower end of this cylindrical member has saw teeth on it, arranged in perfect concentricity with the cup member, and with the drill.

A compression spring encircles the center drill, and this, bearing against the work is forced into compression as the hole saw penetrates the work. After cutting thru the

metal, as the hole saw retreats, the compression spring reacts, to force the "washer" off of the center drill, thus clearing the tool for the next operation.

The word "washer" was used in the foregoing only for its descriptive value. However, there are tools of this general type that have been developed for the production of both holes and usable washers, as the need may arise.

One tool of this kind has two wing bars, extending out from the sides of the main tool body. Two separate cutting tools are made adjustable on these wing bars, for cutting different diameters of holes and washers.



No. 14 Angle Rolling Machine

**ROLLS ANGLES, TEE IRON, PIPE,
FLATS, ROUNDS AND SQUARES**

CAPACITY—2"x2"x¼" ANGLE

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HERE IS A *Machine*

**THAT HAS FOUND ITS WAY INTO
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**SHIPS—PLANES—TANKS—AUTOMOBILES—ENGINES—FURNACES—
FARM MACHINES AND METAL
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7" HORIZONTAL SHAPER

3 1/2" VERTICAL SLOTTER



THE RHODES MANUFACTURING CO.
WALTHAM 54, MASS., U. S. A.

STRAIGHTENING

Many kinds of equipment for straightening various metal parts and products are in use. One of the simplest, found in use in various places, for straightening shafts, bars, etc., of relatively short length, allows the workpiece to lie on two anvils that mount on a hand press table. A pressure head, mounted on a vertical screw, descends from above as the screw is actuated manually, to bring pressure to bear on the workpiece, at a point midway between the two anvils. Pressure is brought to bear on the high

points in order to do the straightening. The head on one such press has a 9" stroke.

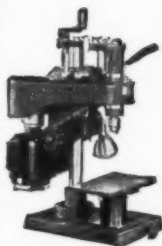
Very much the same idea is incorporated into hydraulic presses used for straightening short, hardened steel shafts. One hydraulic press of this kind has a capacity of 15 tons. It is equipped with special gauges and centers, to enable the operator to find just where the pressure points are, for straightening. Further, this equipment reveals exactly how much straightening has to be done, in thousandths of an inch, and does the straightening, with full control. It is subject to modification for straightening other kinds of work also.

Many times, products are made either wholly or in part from wire. Since the wire used is taken from coils, a straightening

operation on it is necessary. To facilitate production, machines have been devised and put into use which will take wire from a coil, straighten it, and cut it into pre-determined lengths, all in the same operation.

On one machine of this kind, as the wire is drawn from a coil at the left-hand end of the unit, it passes thru a set of rough-straightening rolls, then on thru a finish-straightening head, then on in between a double pair of feed rolls.

A cut-off head operates in conjunction with an adjustable-length gauge.



Aye,

AND FOR PENNIES

Small holes, .004" to 5/16" in all drillable materials, are easily, quickly and accurately obtained with the Hamilton "Varimatic" Super Sensitive Variable Speed Drilling Machine. Horizontal work capacity to the center of 10". Vertical travel of self-contained drilling unit on column, 6 1/2". Speed range from 840 to 9300 R.P.M.

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SUPER SENSITIVE DRILLING MACHINES
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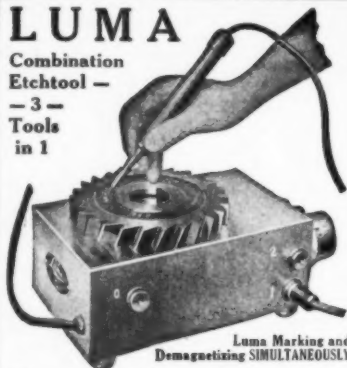


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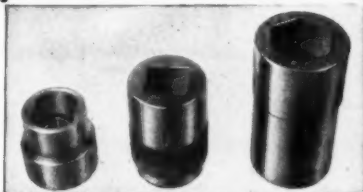
The Platen increases capacity of the
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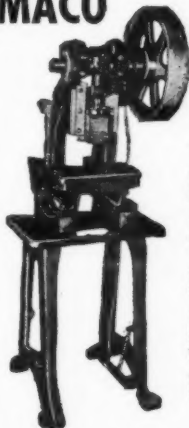
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Popular sizes carried in stock with $\frac{1}{2}$,
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Made of special alloy steel heat treated
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Heavy inner rib reinforces each socket.

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main brgs. $1\frac{1}{2}$ "
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RAM stand stke. 1"
maximum stke. $\frac{1}{2}$ "
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OVERHANG, center
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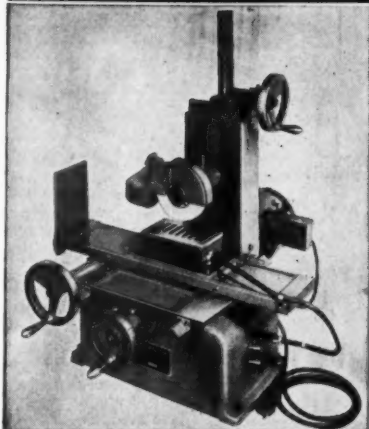
BED, area bolster
plate 12×7 "
Size of opening
through back 7"

MOTOR required, $\frac{1}{2}$
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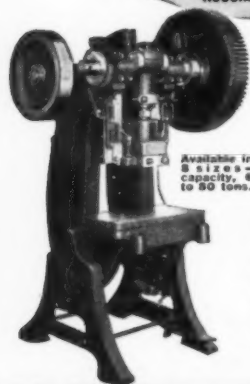
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A sensitive machine built to rigid
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SPRINGS

There are many interesting aspects to the manufacture and use of springs, whether in small or large volume. Heat treating and subsequent cleaning of helical springs has been a real problem in many plants, for helical springs are difficult to clean thoroly unless it be by pickling or sandblasting. Consequently, where hardening scale occurs, the production rate on large lots of springs suffers considerably.

That is why manufacturers handling a considerable number of springs and similar small products favor hardening furnaces which protect the parts against

scaling. Some of these furnaces are designed in such manner that the parts are discharged directly from the furnace chamber into a quench tank below. This method eliminates an intermediate exposure of the heated parts to air, while they are being quenched.

Many manufacturers, of course, have found it advantageous to purchase their springs, in view of the fact that there are many adequate sources of supply. Springs for special purposes may be obtained quite readily.

Helical die springs, as a case in point, are provided by different manufacturers, in complete lines, to fill any die-making specifications. Die springs designed for high deflection at medium pressure, for medium deflection at high pressure, or those in between, are readily obtainable. Trip springs

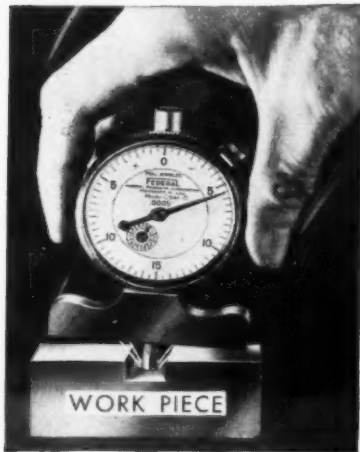
of phosphor bronze, which have long life, can also be obtained quite readily.

How about the shop which is always needing springs of one kind or another, but in such small quantities that it is a nuisance to depend on outside sources of supply? Many firms of this type depend quite largely on spring winders.

One line of spring winders comprises three different models. One of these will handle wire up to 3/32"; another all sizes up to 3/16", and the third all sizes up to 5/16". One can wind extension, compression, torsion, taper, double taper or left hand springs with these tools, so it is little wonder that they are popular.

FEDERAL "CUSHIONED MOVEMENT"

A new shock absorbing mechanism termed "Cushioned Movement" has been built into their Dial Indicators by Federal Products Corp., 1144 Eddy St., Providence 1, R. I.



It's function is to absorb the impact of sharp blows or rough handling, so that the force of these is cushioned before it reaches the small gear teeth, jewels, pivots or other intricate parts of the Indicator Mechanism itself, and causes basic injury to the instrument. The efficient Federal Indicator movement has not been altered, nor is the size and appearance of the Indicator changed in any way.

It is reported that ample use in the field under diverse trying conditions, has already fully demonstrated the economic value and practicability of this new "Cushioned Movement". In one instance a user checks the depth of over 40,000 fuse parts per day without trouble or repairs on the Indicator. In another case, one Indicator was in constant use for 16 hours a day, 6 days a week, under what was referred to as "very abusive" treatment. Careful examination following this use showed that all mechanical parts of the Indicator were in perfect condition with its repetitive accuracy unimpaired.

All regular Improved Movement Federal Indicators having A.G.D. range in C, D & E sizes (English Dials) and P, Q & R sizes (Metric Dials) can now be furnished with the new "Cushioned Movement". The exceptions to this are models EBS and Q6IS.

Regular Federal Dial Indicators now in use (with the exception of the B sizes) may be returned to Federal for the purpose of installing the new "Cushioned Movement", at a nominal cost.

CUTTER LIFE EXPANDED

A more than 60% increase in the number of sizes of "Detroit Standard" thread milling cutters carried in stock ready for thread grinding to customers' specifications is announced by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich. The standard cutters now available include 12 new shell type cutters, making a total of 52 shell type standards; and 20 new shank type cutters, making a total of 32 shank type standards. All of the new shank type cutters are available in either Jarno, Morse, or B. & S. tapers, as are the original standards.

The expanded line of standards represent largely additional sizes as to width of cutter face and diameter. These now permit users to select standard cutters of either the exact size or so close as to enable economical substitution for all major thread milling operations. The shell type cutters currently carried in stock in blank form range from $1\frac{1}{2}$ " in diameter and $\frac{1}{2}$ " face width to $3\frac{1}{2}$ " diameter and 2" face width, running in $\frac{1}{4}$ " steps from the $1\frac{1}{2}$ " diameter to the $2\frac{1}{2}$ " diameter inclusive and by $\frac{1}{2}$ " steps above the $2\frac{1}{2}$ " diameter. The shank type cutters range from $\frac{3}{4}$ " diameter and $\frac{3}{4}$ " face width to $1\frac{1}{2}$ " diameter and $1\frac{1}{2}$ " face width in $\frac{1}{4}$ " steps.

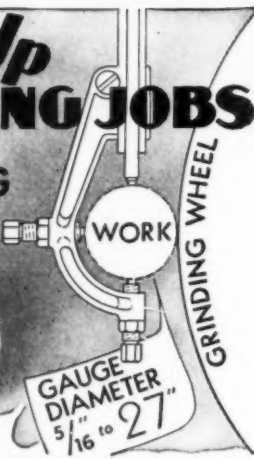
To illustrate the range of cutters now available as "standard" there are for instance, 12 types of $2\frac{1}{2}$ " diameter shell type cutters with face width of from $\frac{3}{4}$ " to $2\frac{1}{2}$ " inches. Each of these is available either topping or non topping, with full length threads or with plain milling portions at either or both ends.

"Detroit Standard" thread milling cutters, moreover, are available with virtually any thread form, including Acme, Buttress, National, Modified Whitworth, etc., and for both internal and external thread milling.

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CRANKSHAFT OPERATIONS

The time-honored method of producing crankshafts is to forge them roughly to shape before machining them, the other methods of production are also used. Forging equipment particularly suited for use in forming crankshaft blanks is available. Also, crankshaft forgings, as such, are to be had from a large number of manufacturers. In many cases, crankshaft forgings are purchased by the manufacturers, and machined to the required dimensions in their own plants.

The fact cannot be ignored that of recent years, crankshafts have been cast

in some places, using high test alloy iron for the purpose. Cast crankshafts have proven entirely practical within limits.

How far the practice of casting crankshafts will go in the future remains to be seen. Far less metal must be removed in the machining operations, where cast crankshafts are used, than where they are block-forged from ingots.

Various machining operations, tests made on machined crankshafts, and other aspects of crankshaft production are highly interesting. There are, of course, special crankshaft lathes in use in many places. The bearing seats on crankshafts must be highly accurate, and it is quite common practice to test them with dial indicators. A complication arises here, in the case of crankshafts having their throws positioned quite close together, since the body of the ordinary dial indicator will not enter in between the throws. However, indicators are made by some firms, which have dial diameters of only 1 3/4", designed especially for getting into tight places. These are often used for testing.

Special grinding operations are encountered on crankshaft jobs, in addition to the regular grinding. In one instance, it was necessary to grind the cheek face of a single-throw crankshaft, square with the shaft axis, to receive a counterweight. For this, a special fixture was provided on a rotary surface grinder.

ANDERSON HYDRAULIC PRESS WITH TRAVELING RAM

To facilitate loading of heavy work in straightening presses, Anderson Bros. Mfg. Co., Rockford, Ill., have developed a new power hydraulic press.

With traveling ram at one end of press, the crane can lower heavy work into place on machine. Then the traveling ram can be placed over work wherever required.

Traveling ram rolls on four ball bearing equipped wheels and the balanced ram assembly rolls with remarkable ease. Table is equipped with "V" slide on which are mounted spring loaded centers and checking rolls.

The indicator takes guess work out of the straightening operation. It tells the operator four things:

- 1—The amount of runout—
- 2—Where to stop the shaft and do straightening.
- 3—During the pressure operation, it tells operator how much he is bending the shaft;

4—As soon as pressure is released it tells him what happened on the first straightening "try" and gives a guide for the next operation.

The bed is a welded structure 11' long. Length can be made to suit customer's requirements.

Capacity of this particular press is 50 tons or 100,000 pounds which is the maximum size manufactured.

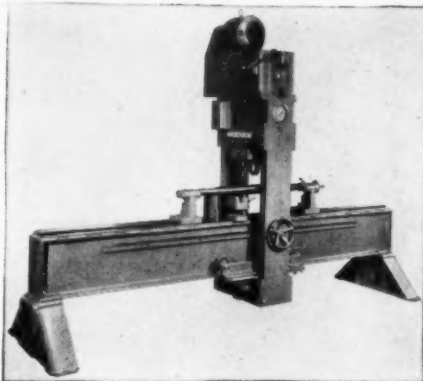
Hydraulic unit is manufactured by the John S. Barnes Corp., Rockford, Ill., and was designed especially for this particular straightening press.

Length of ram stroke is 6". Longer strokes are available to suit customer's particular work. Power requirements call for a 3 hp motor.

SUTTON COLLET CATALOG

Sutton Collets and Feed Fingers for automatic and hand screw machines, lathes and milling machines are illustrated and described in the new 2-color 28 page Catalog No. 16 just published by The Sutton Tool Co., Sturgis, Mich.

Specifications and prices are listed for each size of round, square, or hex and master collet, and solid and super feeders. Illustrations are included of each type collet and feeder. Sutton full floating collets for hot and cold rolled stock are described showing details of interchangeable and replaceable diamond-serrated jaws. Likewise cited are the advantages



of the Sutton Super Feeder such as the compressed spring principle permitting equalized and direct gripping pressure.

Sutton Collets feature the diamond grip action designed to give a tighter grip with less chucking strain and less wear on the Collet, reducing spoilage due to slipping.

ALCO REVOLVING STOP

A new Revolving Stop for automatic Screw machines has just been added to the ALCO line of tools for the screw machine industry. So many screw machine departments were making their own stationary stops which were not efficient and were marring ends of the work because of the extreme friction created, that Alco engineers were asked to design a less expensive and more efficient tool for the purpose.

Outstanding features of this new tool include the rugged construction with dual bearings completely enclosed to prevent chips or dust from clogging them; proper hardening to withstand continued and hard usage; revolving action of the head which comes in contact with the work end, will not pick up grit, chips, or dust which caused roughing of the work; positive and easy action to retain accurate lengths on production runs.

Made in sizes from 3" to 6" overall length, $\frac{5}{8}$ " to $1\frac{1}{2}$ " shank diameter, and $\frac{3}{8}$ " to $1\frac{1}{2}$ " contact diameter of head.

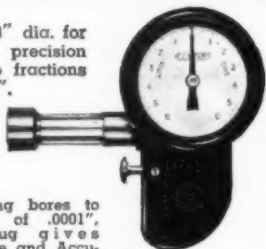
Illustrated bulletin and complete catalog of Alco Tools is available from The Alco Tool Co., 252 Birdseye St., Bridgeport, 4 Conn.

HIGH GRADE TOOLS & SPECIAL GAGES

AMERICAN TOOL WORKS, INC.
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The MODERN Internal Gage **COMTORPLUG**

1/8" to 8" dia. for
gaging precision
holes to fractions
of .0001".



In gaging bores to fractions of .0001", Comtorplug gives new Ease and Accuracy: EASE that enables trainees to get the same results as skilled operators; ACCURACY assured by automatic alignment and centering independent of human variations. Shows ACTUAL size, front or back taper, out-of-round, bell mouth, etc.

Request New Bulletin 31

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By angle adjustment, straight
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using Graham
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STRAIGHT KNURLS, cuts wide variety
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No. 2 To No. 6

Screws Driven on this Husky but Sensitive Hopper Feed Screw-driver.

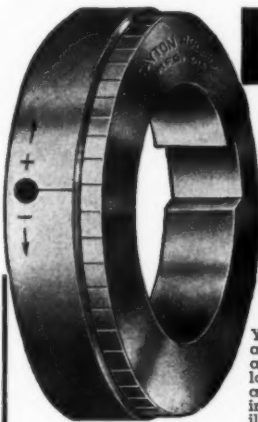
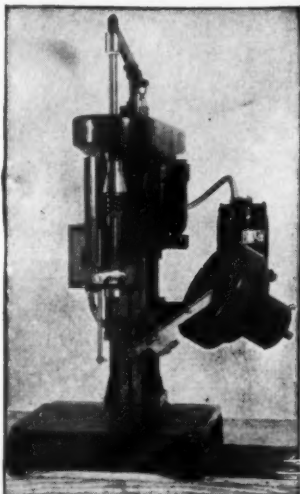
No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.

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FAST, ACCURATE SPACING

Graduated in thousandths, you have plus or minus .0005" at your fingertips with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

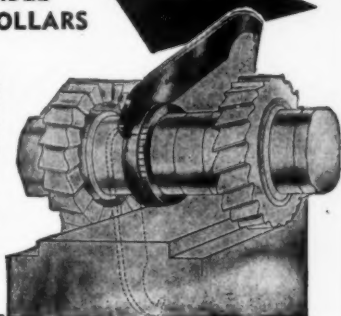
You can make an accurate, positive adjustment just by loosening the cutter arbor nut and making adjustment as illustrated.

Made in 12 standards for cutter arbors from $\frac{7}{8}$ " to 2". Write for illustrated Bulletin 120-7.

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**SIDE MILLING
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**GANG MILLING
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Moline Tool Company since 1901 has been designing and building machine tools of the highest degree of efficiency for these operations:

- Boring—rough, semi-finish and finish
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 - Straight Line Drillers
 - Universal adjustable spindle drillers
 - Way Type Machines—horizontal and vertical drilling, tapping and boring machines
- "Hole Hog" machine tools are versatile—their construction makes possible easy change-over to other jobs. They are easy to operate and are ruggedly built for years of continuous production service. For man-hour savings—for more efficient, smoother work—look to Moline machines.

Write for information concerning machine tool equipment for your special problems.



MOLINE TOOL COMPANY

108 20th Street

MOLINE, ILLINOIS

CUTTING OILS

Metal cutting lubrication has taken on increasing importance with the passing of the years. Few shops may be rated progressive that have not had occasion to discuss some of their cutting problems with lubrication engineers. Many of the larger manufacturers of cutting oils maintain such engineering service, and the very fact that they do maintain it, gives them an insight into so many varied problems that they automatically become authorities. Lost time, poor results and damaged tools all camp on the trail of the

production man who loses sight of the importance of proper coolant application.

It is of interest to note coolants that are really not oils. One of these comes in the form of a semi-solid base, which is diluted with water to suit the specific job. It is said to have great heat-dissipating power, holding the work down almost to room temperature, while the tool is in the cut.

The coolant is transparent, instead of being milky in color, and therefore gives a clear view of the actual machining in progress. There are no bad odors and nothing that can cause dermatitis. This coolant is entirely water-washable, requiring the use of no solvents or alkalis for its removal. It is used on all types of metals, from aluminum to molybdenum steel. It speeds cutting and saves wear.

Whatever type of coolant is used, it is a matter of extreme importance to see that it reaches the point of cutting in adequate volume, at all times. There are firms that supply full lines of centrifugal pumps for this purpose. Some of these pumps are designed for submergence in the coolant tank, while others are arranged for mounting against the side of the container holding the liquid.

Still others can be used in any desired position, so long as the liquid will flow to pump. Tanks supplied on order.

Still others can be used in any desired position, so long as the liquid will flow to pump. Tanks supplied on order.

MEASURING A PLUG GAGE with LIGHT WAVES using an optical flat, a toolmakers flat and a gage block

The formula is:

$$D = h + (.000012 \times N \times \frac{W}{w})$$

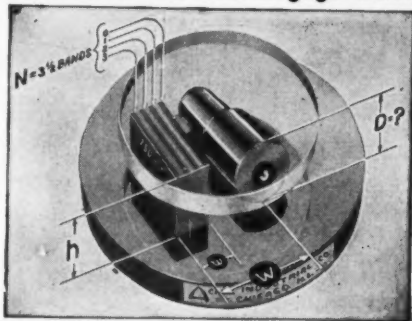
Substitute the actual values

$$D = .750 + (.000012 \times 3\frac{1}{2} \times \frac{1\frac{7}{16}}{23/64})$$

and get the answer

$$D = .750168 \text{ inch.}$$

It's just that simple!



Write for new, free Lightwave Measurement Booklet.

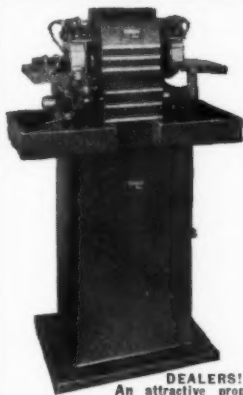


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An attractive propo-
sition open in certain
territories.

WILLEY'S NEW CARBIDE TOOL GRINDER

Willey's new 50-A Grinder is compact and designed for the rapid, economical grinding of carbide tipped tools as well as other types of tool bits that require keenest cutting edges and extreme accuracy. It handles rough, semi-finish and finish grinding of tool bits having up to 2" square or equal cross section area. Bronze bearing trunnions support the tool rest table 3/4" below work center, permitting grinding tools from 3/16" to 3/4" square without further horizontal movement — a Willey's feature that speeds production.

WRITE FOR FOLDER

Complete specifications and illustrations of this new Willey's Grinder Model 50-A.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway

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205 Illustrations

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FORGING OPERATIONS

Equipment used for various kinds of forging operations includes whatever kind of heating apparatus one may choose to use, in addition to actual forging machines and presses.

Among various forges used for heating such work, gas-fired equipment has been finding a great deal of favor. Gas-fired forges include those of utility bench type, which are very popular in the tool rooms. They are also quite widely used in forging surgical and dental tools. On some of the smaller work, forging heat can be obtained from "cold" in two

minutes and sometimes less.

Larger bench forges, for handling larger and heavier work, will bring metal to a forging heat in from 15 to 25 minutes, depending on the work itself. All-purpose forges, for general work, are often used in floor style, being quite similar to the heavier bench forges, except for the fact that they are mounted on legs.

Regular forges of gas-fired type are often provided with pedestal types of bases, and have facilities for adjustment by means of one valve only, providing correct air and gas mixtures for most efficient heating over the entire operating range.

These are used on all kinds of small and medium-sized work, such as chisels, lathe and planer tools, and general forging. Cutlery forges of gas-fired design are of a special type, suited for heating the ends of numerous small blanks, such as punches, chisels, scissors blanks, etc. A number of parts are heated simultaneously, and as fast as a hot piece is removed for forging, it is replaced with a cold one, thus maintaining a continuous operating cycle. Heavy-duty forges of gas-fired type are also found in use in various places. They eliminate the dirt and smoke often found where oil or coal-fired equipment is in use, and when rightly used, allow scaling of the work to be held to a minimum.

Another interesting type of furnace is designed for making Van Stone joints.

CUT ANY SHAPE BETTER with BEVERLY Throatless SHEARS



The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

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**MODEL 1236
36 IN. THROAT
12 GAUGE
CAPACITY**

**CIRCLE
CUTTING
ATTACHMENT**
Included gas
STANDARD
EQUIPMENT
with this
machine

**LIBERT MACHINE CO.
GREEN BAY • WISCONSIN**

for BETTER PRODUCTION and MAINTENANCE *at lower cost*

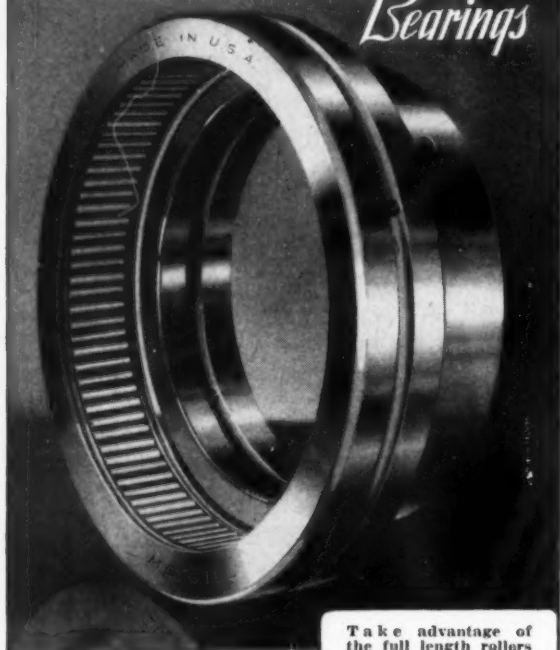
A proved time-saver in any sized shops
Libert's *flexibility* gives you a wider
variety of work—clean shearing of flat
or formed sheet metal...straight or
irregular shapes...inside or outside
cuts. Libert *simplicity* means that even
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work, lots of it *and fast!*

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Made in sizes up to 60 in. throat, 10 gauge capacity

Libert *Hi-Speed* SHEAR

McGILL SOLIDEND MULTIROL Bearings



McGILL Manufacturing Co., Inc.
Manufacturers of
Ball and Roller Bearings
VALPARAISO INDIANA

Take advantage of the full length rollers of McGill "Solidend" MULTIROL Bearings. We will be glad to send you our catalog SM-42.

DRILL PRESS REFINEMENTS

One sees many refinements applied to the time-honored drill press as the years pass, such as better methods for holding different kinds of work.

Drill press vises are an interesting case in point. Some vises now in use are designed with such fast-opening and closing actions that the time required for mounting the workpieces is reduced almost to the vanishing point. On small work that must be indexed, for drilling a number of holes in circular formation, first class collet indexing fixtures have been made available, and are found in

use on many drill presses.

Are you aware of the fact that in a number of cases, drill presses have been fitted with special hopper-feeding attachments, in order to speed production? Automatic hopper feeds are individually designed and engineered by firms specializing in this line of work, to fit various metal-working machines, including drill presses. It is easy to think of various kinds of drilling work where arrangements of this kind mean the saving of a great deal of time.

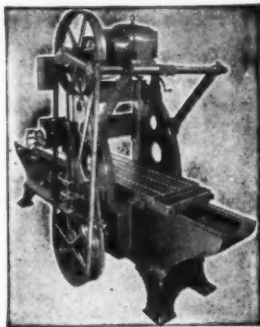
Deep drilling has always been more of a problem than drilling relatively shallow holes, because the flutes of the drills become clogged with chips, in such manner that the lubricant or coolant does not reach the cutting lips of the drills. What lubricant does get down to the points of the drills actually cannot get in between the cutting edges

and the chips being lifted by drill.

It is highly interesting to note that a device has been developed which actually lifts the drill a slight amount, at each revolution, breaking the chips, and allowing lubricant to flow to the actual cutting edges of the drill. Using such a device, there are no long, whipping chips, but the short chips produced issue from the hole quietly, and are washed away at once by the coolant. Many times, in ordinary drilling, where a hole is more than five diameters in depth, it is necessary to pull the drill out of the hole, before going the full depth, to clear the flutes, and to lubricate the drill point.

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Eliminate Lineshafting



Now you can have added flexibility in plant layout, because Masterdrive eliminates lineshafting and permits placing planers wherever you wish.

The drive is supported by four supports. Each of these require the drilling and tapping of four holes. Once supports and horizontal bars are in place, motor base and outboard bearing support can be moved laterally to line up with pulleys. Your present ceiling lineshaft pulleys are used on the motor counter shaft.

A single complete installation with Masterdrive — one responsibility. Write today for details of planer or other Masterdrive applications.

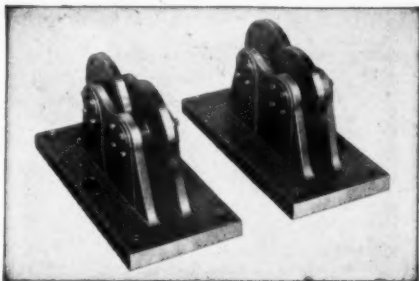


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Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work.

Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings. Many manufacturers have endorsed them for profitable, efficient, static balancing.



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BULLETIN 5-5**

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BROWN & SHARPE MACHINES

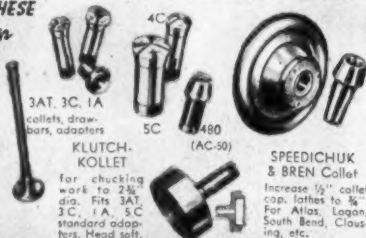
IMMEDIATE DELIVERY FROM STOCK



The addition to the Precision line of collets and feed fingers designed for use in Brown & Sharpe machines gives you a dependable source for speedy delivery . . . And as always, the Precision name on these new collets and fingers is your unconditional guarantee of selected steels, uniformity in machining, grinding and heat treating. You will like their lasting spring quality and hair-trigger accuracy.

DO YOU KNOW THESE
OTHER Precision
PRODUCTS . . .

Precision lathe collets fit many machines and attachments including 10" Atlas, Logan, Craftsman, Power-Kraft, South Bend, Clausing, Sheldon, Hardinge, Elgin, Dalton, Schauer, Sebastian, etc.



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bars, adapters

KLUTCH-
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for chucking
work to 2 3/8"
dia. Fits 3AT,
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standard adap-
ters. Head soft.

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SPEEDICHUK
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Increase 1/2" collet
cap. lathes to 3/4".
For Atlas, Logan,
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sing, etc.



GENERAL DIE AND STAMPING COMPANY
PRECISION COLLET DIV., 268 Matt Street, New York 12

It pays to specify Precision when collet work is indicated, because you get the best, and you get it promptly from stock. Order from your Industrial Supply Distributor. . . He is ready to serve you. Literature is available. Why not write for it today.

3,500, according to results of a survey conducted by one of the basic aluminum producers.

Developments in processes, fabricating technique, new alloys, and the creation of new uses made under war pressure, as well as the almost fantastic growth of the basic aluminum industry during World War II, are largely responsible for the public's light-metal conscious-ness.

Aluminum came into common use only about 58 years ago, and that is a brief span in a metal's history.

Iron and copper have served mankind for thousands of years, lead almost as long, and tin and zinc have been used for centuries.

The metal was first isolated in 1825, by the Danish scientist Hans Christian Oersted, but it was not until the

discovery of a process for its extraction by electrolysis in 1886, simultaneously and separately by the 22-year-old Charles Martin Hall, a graduate of Oberlin College (Ohio), and a Frenchman, Paul Louis Heroult, that an aluminum industry came into being.

Aluminum alloys may be fabricated into practically all the forms and shapes, and by all the methods used on other metals. It is produced in a wide variety of specifications for definite uses. Specialty products even may be had in colors to add appeal to consumer goods.

ALUMINUM

Aluminum—which went to war in a big way, from planes and ships to the GI mess kits—is now available to the manufacturer of civilian goods in greater quantities than ever before. Its lightness, strength, corrosion resistance, and dimensional stability make it particularly adaptable for use in many industries and products. From now on this versatile metal may be expected to become a part of our everyday life in increasing volume. From 1,500 actual uses before the war, applications now have grown to around

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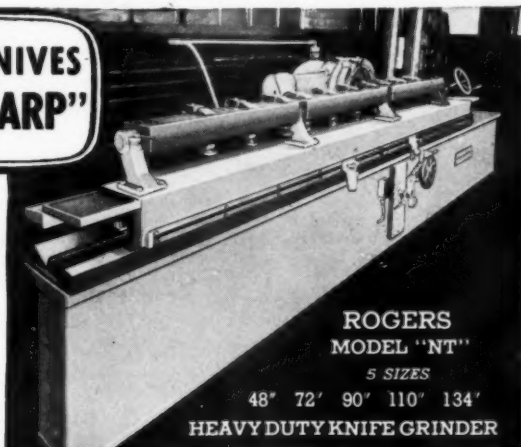


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"ROGERS SHARP", — that's the superior keenness your knives maintain when ground . . . in your own plant . . . on this Rogers "NT". Saves delays and expense of sending knives away. Saves knife wear too. No skilled operator needed. Exclusive features. Send for circular "NT" and reasonable prices.

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**ROGERS
MODEL "NT"**

5 SIZES

48" 72" 90" 110" 134"

HEAVY DUTY KNIFE GRINDER

ROGERS KNIFE GRINDERS

VICTOR'S BARGAINS IN TUNGSTEN CARBIDE TIPPED TOOLS

Price \$.90 Each In Any Size

New Low Prices — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left — 100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	$\frac{1}{4} \times \frac{1}{4} \times 2$
R-101	L-102	$5/16 \times 5/16 \times 2\frac{1}{4}$
R-103	L-104	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
R-105	L-106	$7/16 \times 7/16 \times 3$
R-107	L-108	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



200 SERIES

Right — 200 Series

Tool No.	Shank Size
200	$\frac{1}{4} \times \frac{1}{4} \times 2$
201	$5/16 \times 5/16 \times 2\frac{1}{4}$
202	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
203	$7/16 \times 7/16 \times 3$
204	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



Below — 300 Series

Tool No.	Shank Size
300	$\frac{1}{4} \times \frac{1}{4} \times 2$
301	$5/16 \times 5/16 \times 2\frac{1}{4}$
302	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
303	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

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NEW HIGH SPEED

SIDE MILLING CUTTERS



Diameter Inches	Face Inches	Hole Inches	Our Net Price Each	Diameter Inches	Face Inches	Hole Inches	Our Net Price Each
2	$\frac{3}{16}$	$\frac{1}{2}$	\$ 2.65	5	$\frac{1}{16}$	1	\$10.00
2	$\frac{1}{4}$	$\frac{3}{8}$	2.77	5	$\frac{3}{8}$	1	10.00
2	$\frac{3}{8}$	$\frac{3}{8}$	3.02	5	$\frac{1}{8}$	1	10.00
2½	$\frac{1}{4}$	$\frac{7}{8}$	3.40	5	$\frac{1}{2}$	1	9.51
2½	$\frac{5}{16}$	$\frac{7}{8}$	3.59	5	$\frac{3}{4}$	1	10.52
2½	$\frac{3}{8}$	$\frac{7}{8}$	3.78	5	$\frac{3}{4}$	1	11.46
2½	$\frac{7}{16}$	$\frac{7}{8}$	4.15	5	$\frac{7}{8}$	1	13.42
2½	$\frac{1}{2}$	$\frac{7}{8}$	4.15	5	1	1	13.42
3	$\frac{3}{16}$	1	4.10	6	$\frac{3}{16}$	1	12.50
3	$\frac{1}{4}$	1	4.10	6	$\frac{1}{4}$	1	12.50
3	$\frac{5}{16}$	1	4.35	6	$\frac{5}{16}$	1	12.50
3	$\frac{3}{8}$	1	4.54	6	$\frac{3}{8}$	1	12.50
3	$\frac{7}{16}$	1	4.79	6	$\frac{1}{2}$	1	12.50
3	$\frac{1}{2}$	1	5.04	6	$\frac{1}{2}$	1	12.41
4	$\frac{3}{16}$	1	5.67	6	$\frac{5}{8}$	1	13.92
4	$\frac{1}{4}$	1	5.67	6	$\frac{3}{4}$	1 or 1¼	15.12
4	$\frac{5}{16}$	1	6.36	6	$\frac{7}{8}$	1 or 1¼	17.89
4	$\frac{3}{8}$	1	6.36	6	1	1 or 1¼	17.89
4	$\frac{7}{16}$	1	7.12	7	$\frac{1}{2}$	1 or 1¼	18.00
4	$\frac{1}{2}$	1	7.12	7	$\frac{5}{8}$	1 or 1¼	18.00
4	$\frac{1}{2}$	1	7.75	7	$\frac{3}{4}$	1 or 1¼	21.67
4	$\frac{3}{4}$	1	7.75	7	1	1 or 1¼	25.39
4	$\frac{3}{4}$	1	8.38	8	$\frac{1}{2}$	1 or 1¼	25.00
4	$\frac{7}{8}$	1	10.00	8	$\frac{5}{8}$	1 or 1¼	25.00
5	$\frac{3}{16}$	1	10.00	8	$\frac{3}{4}$	1 or 1¼	28.00
5	$\frac{1}{4}$	1	10.00	8	1	1 or 1¼	33.64

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1/8"	12	9	\$1.50	21/64"	12	9	\$2.25
9/64"	12	9	1.50	11/32"	12	9	2.25
5/32"	12	9	1.50	23/64"	12	9	2.50
11/64"	12	9	1.50	3/8"	12	9	2.50
3/16"	12	9	1.50	25/64"	12	9	2.75
13/64"	12	9	1.60	13/32"	12	9	2.75
7/32"	12	9	1.60	27/64"	12	9	3.00
15/64"	12	9	1.75	7/16"	12	9	3.00
1/4"	12	9	1.75	29/64"	12	9	3.25
17/64"	12	9	1.85	15/32"	12	9	3.25
9/32"	12	9	1.85	31/64"	12	9	3.25
19/64"	12	9	2.00	1/2"	12	9	3.25
5/16"	12	9	2.00				

HIGH SPEED STEEL, TAPER SHANK TWIST DRILLS

EXTRA LENGTH

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
17/32"	15	12	\$6.50	27/32"	15	12	\$11.50
9/16"	15	12	7.00	7/8"	15	12	12.00
19/32"	15	12	7.50	29/32"	15	12	12.50
5/8"	15	12	8.00	15/16"	15	12	13.00
21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1-1/8"	20	15	18.00
25/32"	15	12	9.50	1-3/16"	20	15	20.00
13/16"	15	12	11.00	1-1/4"	20	15	22.00

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May, 1946


MACHINE TOOL BLUE BOOK

391

Mechanics Through the Ages



The CHURCH BELLS
OF MEDIEVAL ENGLAND WERE REPAIRED BY GYPSY TINKERS WHO RUSTLED UP THE NECESSARY METALS IN THE NEIGHBORHOOD OF THE JOB. THESE ITINERANT CRAFTSMEN OPERATED UNTIL THE MID-1700'S



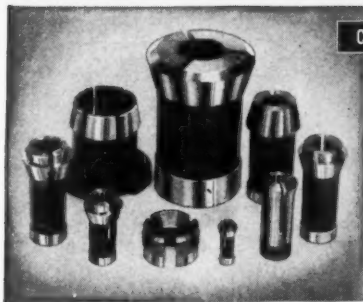
THE 5000 PIECES OF THE ENGINE BUILT IN 1866 FOR THE IRON CLAD 'WARRIOR' WERE SO MATHEMATICALLY ACCURATE THAT STEAM WAS GOT UP AND THE SHIP BEGAN TO MOVE, IMMEDIATELY ON ASSEMBLY.



THOMAS PAINE, FAMED AS THE AUTHOR OF 'COMMON SENSE' AND 'THE RIGHTS OF MAN' WHICH IN 1776 CRYSTALLIZED AMERICAN PUBLIC OPINION FOR FREEDOM, WAS A DESIGNER OF IRON BRIDGES. HE ACTUALLY FASHIONED BY HAND 6-FOOT CAST IRON BRIDGE MODELS AND WORKED OUT NOVEL CRANES, SHIPS AND LANDING WHARVES MADE OF IRON.

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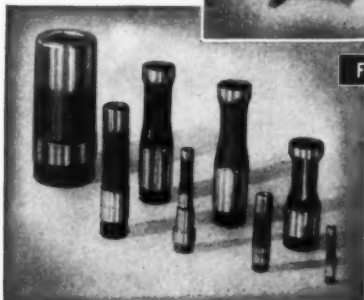
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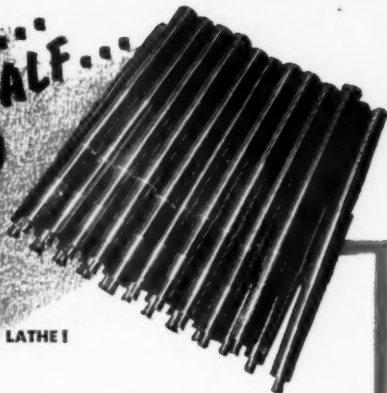
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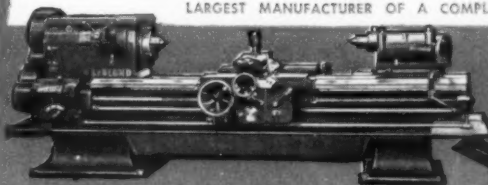
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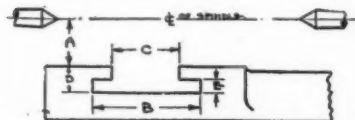


Model
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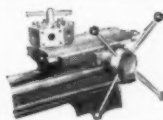
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TOOL SIZE RANGE	5/8" to 1-1/4" or No. 2 toolholder 3/8" square bit - High speed or carbide. (Where no tool bit size is specified, turret will be furnished for No. 2 Tool Holder.)	3/8" to 3/4" (Where no tool bit size is specified, turret will be furnished for 3/4" tool bit.)	1/4" to 1/2" (Where no tool bit size is specified, turret will be furnished for 1/2" tool bit.)	1/4" to 3/8" (Where no tool bit size is specified, turret will be furnished for 3/8" tool bit.)	1/4" to 3/8" (Where no tool bit size is specified, turret will be furnished for 3/8" tool bit.)
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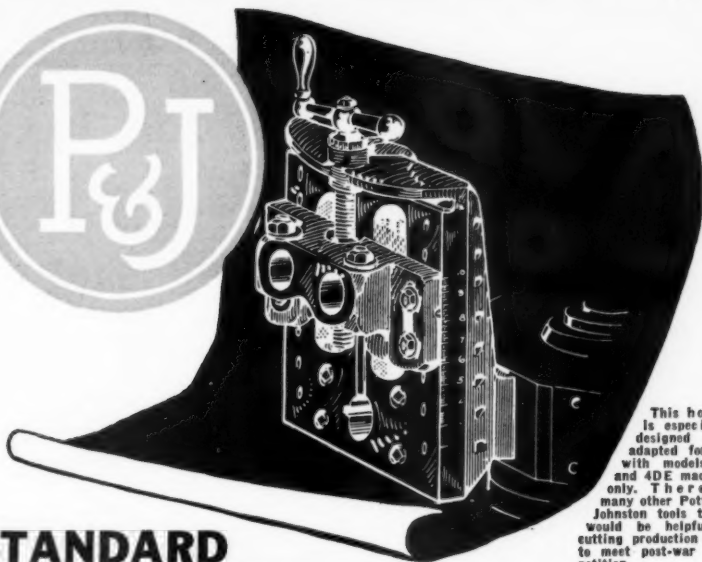
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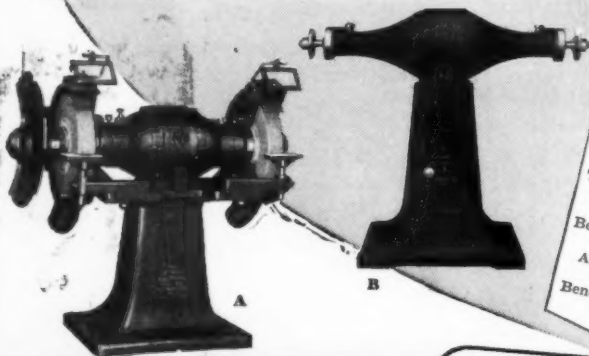
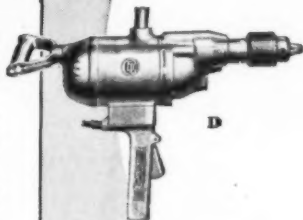
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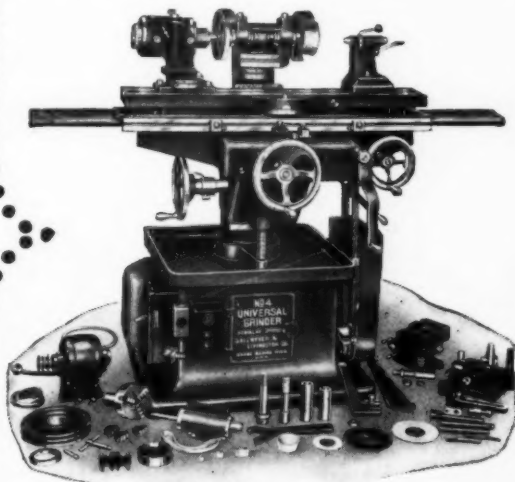
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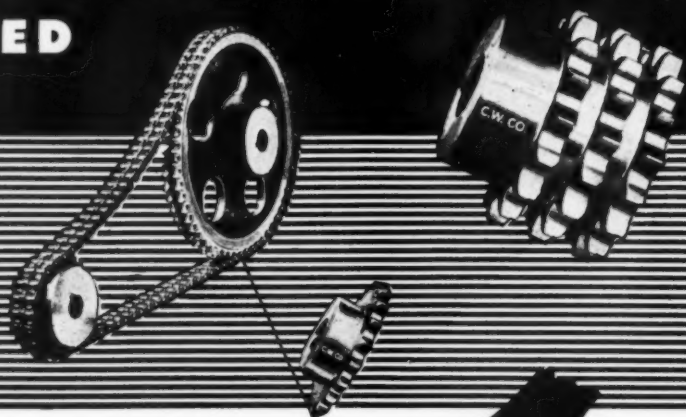


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